American Journal of Surgery

QUARTERLY SUPPLEMENT of ANESTHESIA & ANALGESIA

[American Journal of Anesthesia and Analgesia]

OFFICIAL ORGAN

American Association of Anesthetists
Inter-State Association of Anesthetists
Scottish Society of Anesthetists
New York Society of Anesthetists
Providence (R. I.) Society of Anesthetists

EDITOR
F. HOEFFER McMECHAN, A.M., M.D.

ASSOCIATES

JAMES TAYLOE GWATHMEY, M.D.,
DUDLEY W. BUXTON, M.D., M.R.C.P.,
WILLIS D. GATCH, M.D., F.A.C.S.,
JOHN D. MORTIMER, M.D., F.R.C.S.,
PROF. C. BASKERVILLE, Ph.D., F.C.S.,
ARTHUR E. HERTZLER, M.D., F.A.C.S.,
WM. HARPER DEFORD, D.D.S., M.D.,
ISABELLA C. HERB, M.D.,
CHARLES K. TETER, D.D.S.,
PROF. DR. GUIDO FISCHER,
CARROLL W. ALLEN, M.D., F.A.C.S.,
EDWARD H. EMBLEY, M.D., B.Ch.,
TORRANCE THOMSON, M.D.,
PROF. YANDELL HENDERSON, Ph.D.,
E. I. McKESSON, M.D.,
RICH. H. RIETHMÜLLER, Ph.D., D.D.S.

JULY **1915**

CONTENTS OF THIS ISSUE

THE FIRST MAJOR OPERATION UNDER ETHER IN ENGLAND. (Illustrated) - - - - - - - - - - - F. William Cook, London, Eng. 98

THE USE OF MUSIC IN LOCAL AND GENERAL ANESTHESIA. W. P. Burdick, Kane, Pa. 107

NITROUS OXID ANESTHESIA IN OBSTETRICS. (Illustrated) - Arthur E. Guedel, Indianapolis, Ind. 109

FIFTEEN YEARS' EXPERIENCE WITH ETHYL CHLORIDE AS AN ANESTHETIC - - - - - - - - - - Martin Ware, New York City 112

ANESTHESIA — A FULL-FLEDGED SPECIALTY (Chairman's Address, I. S. A. A.) - - - - - - - - - - W. Hamilton Long, Louisville, Ky. 114

ETHYL CHLORIDE AS A GENERAL ANESTHETIC IN DENTISTRY - - - - - - - - - - - - Maurice Green, New York City 117

THE MANUFACTURE OF NITROUS OXID FOR USE IN HOSPITALS. (Newer Apparatus) - - - - - - - A. R. Warner, Cleveland, O. 124

DEPARTMENTS

EDITORIALS - - - - - 120
BOOK REVIEWS - - - 119-121
SOCIETY PROCEEDINGS - - 122
INDEX AND ABSTRACTS - - 126

THE FIRST MAJOR OPERATION UNDER ETHER IN ENGLAND.

F. WILLIAM COCK, M.D., F.S.A.,
LONDON, ENGLAND.

"Mihi mandatum ex memoriae anima ut temporis ruinas restituam."
"Semper sussurat memoria sed aliquando clamat."

It was a little after midday on Saturday, December 19, 1846—according to Surtee one of the worst days of the worst hunting season on record—when Robert Liston came into his friend Peter Squire, the well-known chemist of Oxford Street, and, pulling out a letter, said to him: "Just read that." The latter, a middle-aged, gray-haired man, glancing through the pages, replied: "This is most interesting and important." "Yes, and you must fix me up something so that we can have it on Monday at the hospital. I have an amputation of the thigh to do, and we will try it then." And hastily bidding Squire farewell, Liston, the surgeon, great not only in reputation, but in stature, hurried off on his busy round.

The letter was from Dr. Francis Boott, a general practitioner, living in Gower Street, in whose house that morning a firmly fixed molar tooth had been extracted from a young lady by Mr. Robinson, the dentist, while she had been insensible under ether. Dr. Boott had shortly before received from Dr. Bigelow of Boston an enthusiastic account, dated November 28, 1846, of the success of ether anesthesia in the Massachusetts General Hospital, where it had been introduced by Morton, the dentist, to Dr. Warren, who had operated on patients under its influence.

Fig. 1. Peter Squire, the well-known Chemist of Oxford Street, who made the first ether inhaler. (From a contemporary portrait lent by his son.)

Fig. 2. Robert Liston at the age of 30.

As Peter Squire was thinking the matter over, his nephew William, afterwards Dr. Wm. Squire, MD., F.R.C.P., came in and, after talking about it, said: "Why not try it on me first?" "Come in to-morrow, and we will see what can be done," was the reply. To-morrow, Sunday, came and William Squire was there early. His uncle had fitted together a Nooth's apparatus and packed the upper detachable cylinder with a sponge and to the exit a flexible tube was attached with an ordinary bronchial inhaler mouth-piece. This afterwards had an expiratory valve attached. Pouring some sulphuric ether on the sponge, he said: "Lie down on the couch there. Take the mouth-piece between the teeth, close the lips over it, and hold the nose firmly." The young man did as he was bid and soon began to cough, for he was practically inhaling ether as if he had applied a Clover apparatus turned on to the full, but without the bag attached. After a time, however, he became more accustomed to the pungent vapor, and finally was completely anesthetized. When he recovered, his uncle, discussing the matter, said he would be wanted to help at the hospital next day in administering the ether.

In the University College Hospital lay Frederick Churchill, a butler, aged 36, for whom these mo-

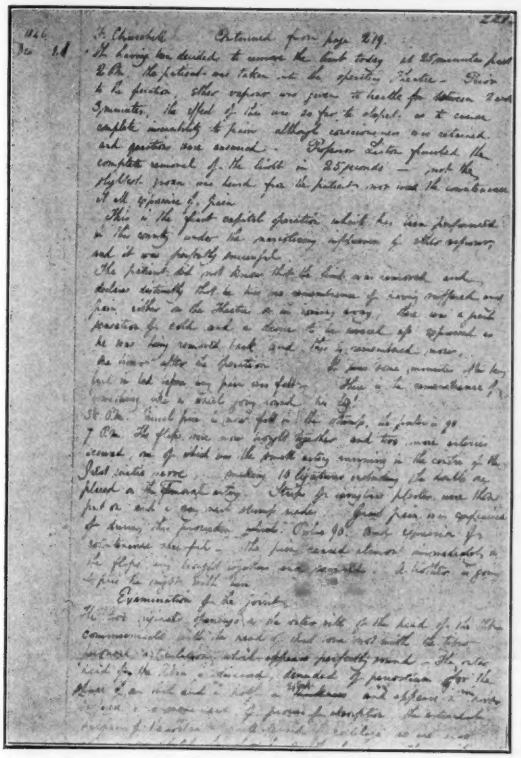


Fig. 3. The record of the first amputation under ether in Liston's case-book.

mentous preparations had been made. He had been admitted on Monday, November 23, 1846, for a discharging sinus from a cavity in the outer side of the head of the tibia. This cavity had been opened before admission, and a number of irregularly shaped laminated bodies removed. The mischief had originally been caused by a fall on the part. "On November 25, Professor Liston examined the sinus with a probe and an incision was made opposite to the tibio-peroneal articulation, and the finger being passed down, bare bone was distinctly felt on the outer head of the tibia. The wound was plugged, but prior to this an attempt was made to ascertain whether the diseased portions of bone were loose; this was found not to be the case. Water dressings were ordered and complete rest." Then the notes go on to give at length a singularly accurate picture of a septicemia induced by the above examination, with fever, night sweats, patchy pneumonia, limb startings, and all the miserable concomitants of infection with the germs attached to the unsterilized hand and instruments of the finest and cleverest surgeon of his day, who had done everything well and correctly according to the best knowledge then available. At last the poor patient was told he must lose his limb to save his life, and he gave his consent, glad to be rid of his torment.

On December 21, the scene changes to the operating theatre of the old hospital, so well known to the past generation of students. When the writer first knew it, it was practically in the same state as in Liston's time. Two sliding doors separated it from the main corridor of the ground floor of the hospital. They were exactly opposite the east door, where the present entrance now is, and almost on the spot where the bust of the new founder of the hospital stands. When one entered, on the right was a small hand wash-basin, on the left the instrument cupboard, which still held a good many of Liston's instruments. In the middle was Liston's table, screwed to the floor by angle-irons. There was a low, sturdy wooden chair, which was used by the surgeons chiefly for cases of piles and lateral lithotomy, or to hold instruments. Then at the foot of the benches came the seat on which sat the staff and visitors, and now and then the senior house surgeon. Above and extending round this were the railings which separated the rising tiers of benches for the students, the lowest one being for the dressers and the junior staff. These railings are now in the writer's garden at Appeldore, in Kent, and with the exception of the table and chair, are, he believes, all that is left of the old hospital. At the foot of the table was a wooden tray filled with sawdust. In front of the instrument cupboard was a small four-legged table; on this the instrument porter put out what was wanted for the day, and to him used to go the anxious examinees to find out the different requirements for various operations, just before their visit to the Royal College of Surgeons.

To return to our story. It is one o'clock: there

Fig. 4. Early portrait of William Squire, M.D., F.R.C.P. (From a photo lent by his son, J. Edward Squire, C.B., M.D., F.R.C.P.)

Fig. 5. Old University College Hospital. Fig. 1 opposite Ward 1. Fig. 2 shows the room of Liston's House Surgeon. (From a photograph lent by Messrs. H. K. Lewis.)

is much bustling to and fro, for it has got about that Liston is going to try something absolutely new at his operations. It is even said that the secret of anesthesia has been discovered. The theatre has already become crowded; soon it is to be crammed to the uttermost. Presently comes William Squire. He moves quietly about, a small table is brought in, and the strange-looking chemical apparatus placed upon it. The flexible tube is adjusted to reach the middle of the pillow on the door end of the table, and the students are conscious of that penetrating odor, now so common, then only known in mixtures for bronchitis, or, when given in small doses, for inhaling in asthma. "Is there any one here who would like to try this?" says Squire. No one replies from the crowded benches. "What, no one!" and looking round he sees one of the hospital porters, Sheldrake, a big, muscular fellow. "Come on, man, let's see if we can put you under." So the porter lies down on the table and sucks away at the tube, young Squire holding his nose. But, after a minute or two, Sheldrake jumps up off the table, and quite intoxicated, shouting and making a tremendous to-do, climbs onto the railings and plunges into the mass of students, who are like a flock of sheep when a dog chases it, separating right and left and letting him nearly reach the door.

Just in time they close on him, and laying hold firmly, keep him till he has quieted down, and then he goes off by the stairs, vowing that he will have no more of the d——d stuff. Then things settle down to the strained waiting which goes before any great event. William Squire rearranges the apparatus, the table is put straight again, not before one had seen, when the mattress fell off, the key-hole apertures on either side of the planks, where the straps go through, which are used to hold down the unfortunates who have to endure the agony of the knife. The well of the theatre is now almost full; it is 2:15 p. m. A firm footstep is heard, and Robert Liston enters—that magnificent figure of a man, six feet two inches in height, with a most commanding expression of countenance. He nods quietly to Squire, and turning round to the packed crowd of onlookers, students, colleagues, old students, and many of the neighboring practitioners, says drily: "We are going to try a Yankee dodge to-day, gentlemen, for making men insensible."

He then takes from a long, narrow case one of the straight amputating knives of his own invention. It is evidently a favorite instrument, for on the handle are little notches showing the number of times he had used it before. His house surgeon, Ransome, puts the saw, two or three tenacula, and the artery forceps, named after the operator, onto the chair close by, and covers them with a towel, then threads a whisp of well-waxed hemp ligatures through his own buttonhole. "Ready, Mr. Ran-

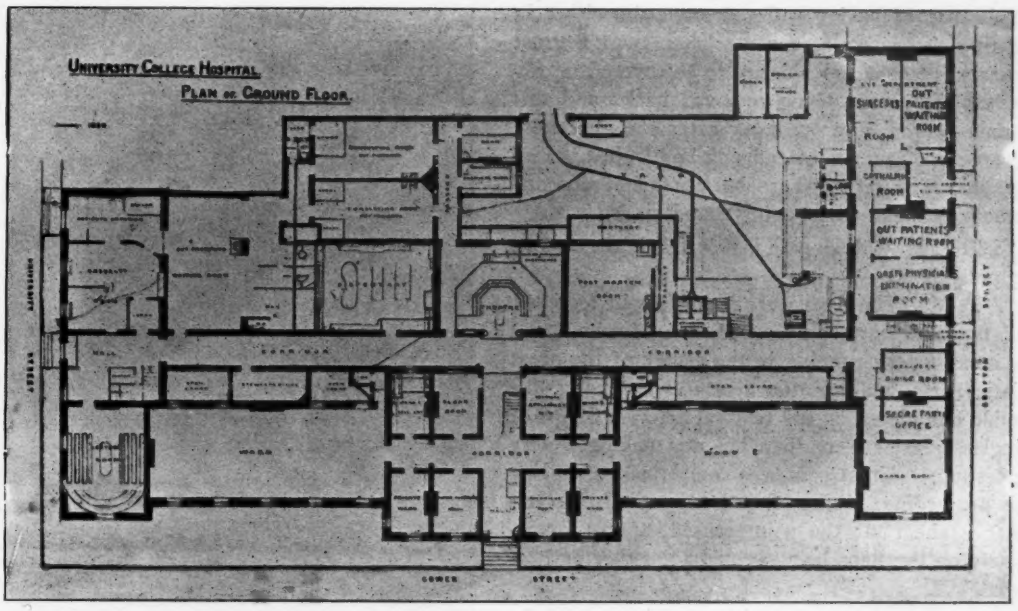


Fig. 6. Ground plan of the old University College Hospital, showing the operating theatre and Ward 1.

some?" "Yes, sir." "Then have him brought in." "Run along, Palmer," and Edward Palmer, the dresser, goes quickly through the sliding doors across the main passage towards the east door of the hospital, and turning sharply to the right, enters Ward 1. The porters are waiting just outside, and the patient is carried in on the stretcher and laid on the table. The tube is put into his mouth, William Squire holds it and the patient's nostrils. A couple of dressers stand by to hold the patient if necessary, but he never moves, and blows and gurgles away quite quietly. Liston stands by, trying the edge of his knife against his thumb-nail, and the tension increases; the patient's breathing gets deeper, more ether is dropped on the sponge. William Squire looks at Liston and says: "I think he'll do, sir." The tube is removed and a handkerchief laid over the patient's face. "Take the artery, Mr. Cadge," cries Liston. Ransome, the house surgeon, holds the limb. "Now, gentlemen, time me," says Liston to the students. A score of watches are pulled out in reply. The huge left hand grasps the thigh, a thrust of the long, straight knife, two or three rapid sawing movements, and the upper flap is made; under go his fingers and the flap is held back; another thrust and the knife comes out in the angle of the upper flap; two or three more lightning-like movements and the lower flap is cut, under goes the great thumb and holds it back also; a touch or two of the point and the dresser, holding the saw by its end, yields it to the surgeon and takes the knife in return—half a dozen strokes and Ransome places the limb in the sawdust. "Twenty-eight seconds," says William Squire. "Twenty-seven," says Buckell, a student, still living. "Twenty-six," echoes yellow-haired Russell Reynolds. "Twenty-five seconds, sir," says proud Edward Palmer, the dresser, to his surgeon, who smiles in reply. The femoral artery is taken up on a tenaculum and tied with two stout ligatures, and five or six more vessels with the bow forceps and single thread, a strip of wet lint put between the flaps and the stump raised. Then the handkerchief is removed from the patient's face, and, trying to raise himself, he says: "When are you going to begin? Take me back, I can't have it done." He is shown the elevated stump, drops back and weeps a little; then the porters come in and he is taken back to bed. Five minutes have elapsed since he left it. As he goes out, Liston turns again to his audience, so excited that he almost stammers, and hesitates and exclaims: "This Yankee dodge, gentlemen, beats mesmerism hollow."

Let us follow the patient for a little, and we cannot do better than again to have recourse to the notes. "Not the slightest groan was heard from the patient nor was the countenance at all expressive of pain. This was the first capital operation which had been performed under the narcoting influence of ether vapor, and it was perfectly successful. The patient did not know that the limb was removed and declares distinctly that he has no re-

membrance of having suffered any pain, either in the theatre or coming away. There was a great sensation of cold and a desire to be covered up expressed as he was being removed back; and this is remembered now one hour after the operation. It was some minutes after being laid in bed before any pain was felt. There is a remembrance of 'something like a wheel going round his leg.'

"3.30 P. M.—Much pain is now felt in the stump; the pulse is 90.

"7 P. M.—The flaps were now brought together, and two more arteries secured, one of which was the small artery running in the center of the great sciatic nerve, making ten ligatures, including the double one placed on the femoral artery. Strips of isinglass plaster were then put on, making a very neat stump. Great pain was complained of during this proceeding. Pulse 90 and expression of countenance cheerful; the pain ceased almost immediately on the flaps being brought together and secured."

The notes go on to say that examination of the limb showed extensive ulceration and destruction of the knee-joint and surrounding tissues. The patient made the usual tedious recovery common in those days, with offensive suppuration and slow granulation. The ligature of the femoral artery came away on the twentieth day. He was discharged cured on February 11, 1847.

It is the same night and the scene is Liston's dining-room at 5 Clifford Street, Old Bond Street. He has had a dinner party and can talk of nothing but the wonderful occurrence of the afternoon. When dessert is about to be removed he proposes

Fig. 7. Railings of the old operating theatre, University College Hospital, now at the Well House, Appledore, Kent.

Fig. 8. The D'Osay lithograph portrait of Liston.

to the company that he shall experiment with William Cadge, his assistant, afterwards the celebrated surgeon of Norwich. So Cadge lies down and obediently sucks away at the tube of the apparatus which had been brought round to the hospital; he hears one of the ladies present say: "Liston, I won't stand it; you'll kill that poor young man." But Liston only laughs and goes on holding down the poor young man by the ears, until he is insensible. But, as Cadge tells afterwards, his powerful thumbs were so strong that he felt the effects of the compression for a long time.

The case of Churchill was one of narcotic anesthesia, not of complete insensibility, as it is recorded that the patient spoke and answered questions while on the table, although totally insensible to pain; but it settled once and for all, in England, the fact that anesthesia was possible. In rather less than six months it is recorded by Mr. (afterwards Sir) William Ferguson that the novelty of ether anesthesia for operations belonged to the past.

At this point I should like to repeat the account given to me, in a recent interview, of an exactly similar operation done by Liston without anesthesia, a week or two before the celebrated one just described.

Through a medical friend, who was interested in

Fig. 9. Wm. Cadge, F.R.C.S., Liston's Assistant. (By permission of the *British Medical Journal*.)

my historico-medical researches, I was introduced to possibly the last surviving amputation-patient of the great surgeon, and spent a most interesting hour listening to his recollection of the event.

In 1911, at the time of my interview, he was an old man of 77, and when about 13 years of age had had a white swelling of the left knee-joint. This had arrived at the stage of night sweats with painful limb startings, when he was sent to the University College Hospital and placed in the private section of Ward IV. From his description, it seems that at that time medical and surgical cases were often mixed in the general wards. A day or two after his arrival, Liston came in and asked when he would like to have the operation. "Will it hurt?" was the anxious query. "No more than having a tooth out," was the encouraging reply. "Oh, I'll have it done to-morrow (Saturday), then I shall be all right on Sunday. "Very well, so be it."

I asked him if he recollected Liston's appearance. He said that he could not remember his face, but that he had an extraordinarily pleasant voice, and that he was very kind. He also remarked that Liston was a very big man and bald, thus bearing out the portrait taken about the beginning of 1847.

Well, on the day of the operation, he was blindfolded and taken downstairs to the theatre, laid on the table and held firmly there. "Was the operation very painful?" "No, although I was bellowing all the time, it was not; but, then, he only took twenty seconds to take off my thigh." This tallies exactly with the recorded quickness with which the best surgeons then operated.

My old friend described the operation almost in the words of Liston's own text-book, and though it was of short duration, he says that he counted the strokes of the saw, which were six. When he was told that the limb was off, he replied: "That's a lie," hardly believing it, owing to the extreme rapidity of the operation. The next thing he remembers was something put between his teeth, which turned out to be a feeder with port wine. He had a good suck at this, and by the time he had finished it the arteries had been tied and he was carried back to bed. The after procedure was exactly as described for the anesthesia case. During the evening the flaps were adjusted after the wound had glazed over and three stitches put in the edges. This he described as the most painful part of the whole business.

He remained in the hospital six weeks and left cured. With the aid of an artificial leg he went through the sixty-five years that followed quite successfully and usefully, and in 1911 was still active, both in body and mind. On being asked whether he recollected anything else about Liston, he replied: "Yes, one day he was doing an eye operation in the ward, at which he was very skillful, and

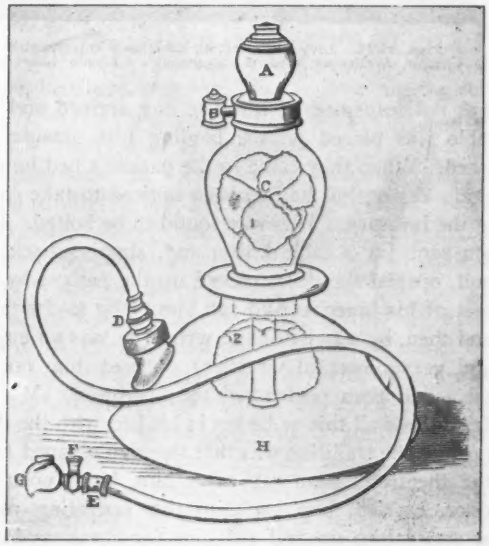


Fig. 10. The Nooth respirator transformed by Squire into the first English ether inhaler.

remarked that it was a somewhat niggling job. "Oh," said the head nurse to my friend, "Mr. Liston likes something to carve at." This shows that as late as 1846 there was no ophthalmic surgeon at the University College Hospital. In the provinces, the general surgeon still often follows this practice of doing eye as well as ordinary surgery.

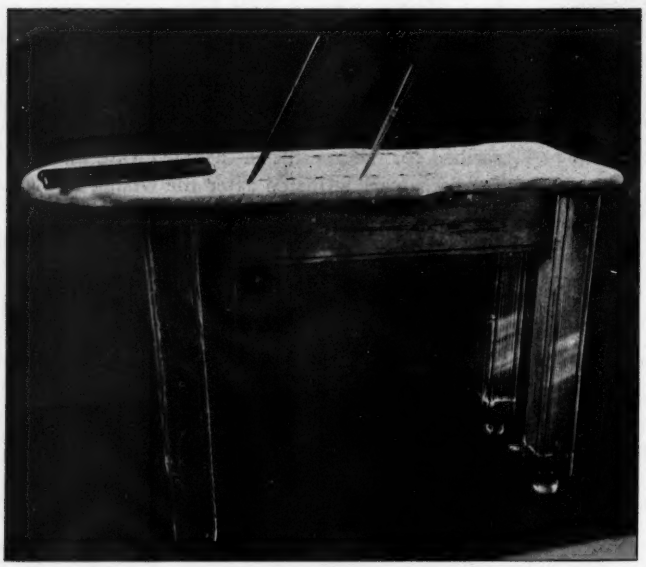
Now comes the corroboration of a legend that was current in my time at the University College Hospital, for my old friend was an actual witness of the following: There was a patient in Ward IV who had something the matter with his shoulder, and he was told on a certain day Liston would operate on him. When he was sought for he could not be found. So another day was arranged and he was not informed of it. The day arrived and the table was placed on the landing just outside the ward. When they came to the patient's bed he was again absent, but he had been noticed to take cover in the lavatory. This was found to be bolted. Liston sent for a table knife, and, slipping back the bolt, opened the door, picked up the patient by the seat of his breeches and ran him along to the table, and then, by a twist of the wrist (he was an expert and very powerful wrestler), turned him on the table and then performed the operation. My old friend saw all this as he lay in his bed with the door open. The tradition was that the man escaped from the theatre, Liston ran after him, burst open the door, carried him back to the operating room, strapped him up and cut him for stone, and that it was all done in two minutes.

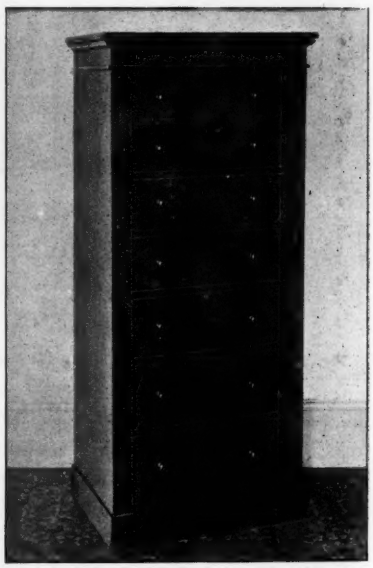
I expect that in preanesthetic times patients often ran away and tried to hide, and that not once nor twice Liston had to forcibly extract his unwilling patients from cloacinian and other refuges. Talking of the pain of the operations, it is recorded that one of Liston's lithotomy patients, on whom he successfully operated, declared that the sensation was not worse than that of being shaved with a blunt razor. This, if not quite the same, is not far off the poet, who, being operated on by Cheselden, the greatest of lithotomists, wrote:

"So swift thy hand, I could not feel
The progress of the cutting steel."

Thus it has fallen to me not only to meet with probably the last preanesthetic thigh amputation case done at the University College Hospital, and to gather together the accounts of the first under the influence of anesthesia, but also, when a dresser in 1879, to extract some fragments of bone from the stump of a Syme's amputation, the owner of which informed me that he was the last patient Liston operated on in the University College Hospital.

My friend Dr. Bruce, who was house physician about 1860, tells me that there were many stories of Liston still current in the University College Hospital at that time. On one occasion, coming into the ward late in the evening, he found a big lad who had a badly fractured arm with commencing gangrene, owing to too tight a bandage under the splint. Pointing out the evident signs to his house surgeon, he picked the boy up, took him to the





Figs. 11-12. Liston's operating table and knives, with their case. (From a photograph lent by Mr. C. J. S. Thompson, Curator Wellcome Medical Museum.) Liston's instrument cabinet, in the possession of the late Colonel Liston.

theatre, and amputated then and there. On another occasion he was very sarcastic at the expense of his house surgeon, who was afterwards my revered friend, Sir John Erichsen, because he had opened an abscess of the calf transversely rather than longitudinally; but we all know the specimen of the aneurysmal tumor of the neck, now in the hospital museum, into which Liston plunged a knife, thinking it was an abscess only. On seeing a jet from the carotid, he said: "Give me a hair-lip pin,"

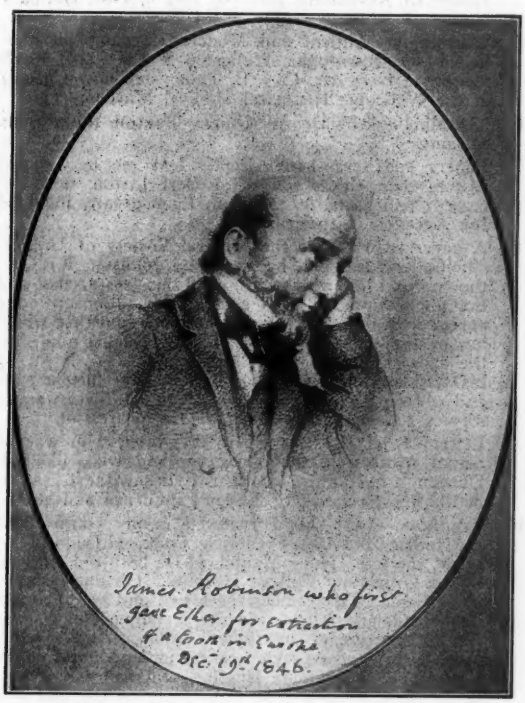


Fig. 13. James Robinson, the dentist, who first gave ether for the extraction of a tooth in Europe, Dec. 19, 1846. (Courtesy of Dr. Hoag.)

passed it through, and fixed it, adding, "To-morrow we will tie the carotid." He did so, but the patient ultimately died; the case being one of scorfulous glands with suppuration opening into the vessel. Even Homer nods.

Liston came of an artistic family, his father, minister of a parish in Scotland, being the inventor of a remarkable pipe-organ. He himself was a good singer and had his house filled with musical and artistic people. We read of him dining at Lady Blessington's, and the last public portrait taken of him was the tinted lithograph done by Count D'Orsay, just six months before his death. He was fond of hunting, shooting and yachting.

Although rough and authoritative when in action, as of necessity were all good surgeons in those pre-anesthetic days, yet he is always described as a kind and most considerate friend to the poor and helpless, and his loss was lamented not only by the rich, but by an enormous crowd of those to whom his charity had been extended.

One or two more little touches. His daughter, who still survives, says, that when out driving with him on operation days he was always very silent and absorbed; and the late Colonel Liston wrote to me, that as a boy of nine, his recollection of his father was that of a most excellent companion, who,

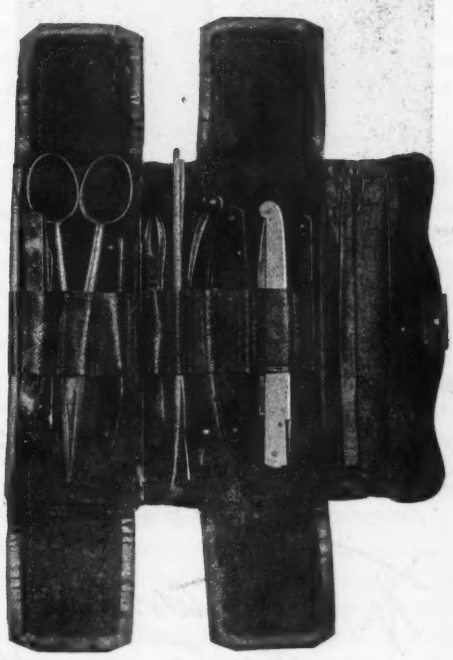


Fig. 14. Liston's pocket instrument case.

when he drove with him, always gave him the shilling from the guineas received at the houses to which he had been called as consultant.

Once more the scene changes. Not quite a year after Churchill lost his leg under ether, a funeral procession slowly climbs Highgate Hill, accompanied by more than 500 medical men and students, friends and pupils of Robert Liston, who has just departed this life, prematurely, at the age of 53, from the effects of an aortic aneurysm, caused by the blow from the boom of his yacht. The service is held in the parish church, the coffin is carried into the adjoining cemetery and left on the top shelf of one of the arches of the terrace catacomb. There, while pursuing these researches in the autumn of 1911, by the light of a candle, the writer, perched on a rickety ladder, read the following, on the half-round closing stone:

Fig. 15. The last portrait of Robert Liston, taken about the beginning of 1847.

"SACRED TO THE MEMORY
OF ROBERT LISTON, F.R.S.
LATE PROFESSOR OF CLINICAL SURGERY
IN UNIVERSITY COLLEGE HOSPITAL
MEMBER OF THE COUNCIL OF EXAMINERS OF THE
ROYAL COLLEGE OF SURGEONS OF ENGLAND
BORN OCTOBER 28, 1794. DIED DECEMBER 7, 1847.
Of him it may truly be said:
"Ante diem periit; sed non sine gloria."

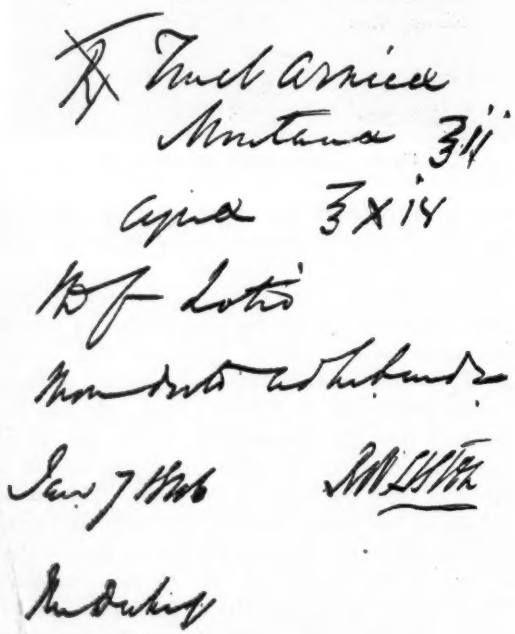


Fig. 16. A reproduction of one of Liston's original prescriptions.

BIBLIOGRAPHY.

1. Notes on the case of Frederick Churchill in Professor Liston's Case Book, taken by the Dresser, Edward Palmer, until almost the conclusion, and finished by Edward Franklyn, his successor.
2. *Pharmaceutical Journal and Transactions,* vol. vi, pp. 337-8 and 350-352. Here the curious mistake of Ransome, the house-surgeon, was made, he giving the date as Friday, December 18, instead of Monday, December 21.
3. The *Lancet* for 1847, vol. i, p. 5 *et seq.,* also vol. ii, 1888, pp. 1220-21. Dr. Wm. Squire's Account.
4. *British Medical Journal,* October 17, 1896, Account of Jubilee of Anesthesia, also for July 4, 1903, Obituary Notice of William Cadge, F.R.C.S.
5. "Anesthesia, Antient and Modern," a pamphlet published by Burroughs Wellcome & Co.; also much assistance from Mr. C. J. S. Thompson, now Curator of the Wellcome Historical Medical Museum.
6. "Anesthetics," by Dr. W. Dudley Buxton, the various editions.
7. Papers and scrap-books kindly lent me by Colonel Liston, then eldest son of Robert Liston, now deceased; and his wife, to whom I am greatly indebted for Anecdota Listoniensia.
8. A paper read before the Medical Society of University College Hospital by Raymond Johnson, F.R.C.S., the perusal of which prompted my researches and the publication of this sketch. Mr. Johnson quite agrees with the observation I made to him that working at the material of Liston's life makes one feel the same enthusiasm for him which was shown by his students and friends. He was every inch a man, and always to the fore in everything that was of service to the advancement of his profession.
9. Letters from Dr. Buckell, of Brighton, who was an actual witness of the operation, and who, like Dr. Duncan, of Harrow, another living witness, speaks in the highest terms of Liston's influence and skill.
10. *Tradition.*—(a) This I received in my youth from my father, the late Frederick Cook, M.D., and my uncle, the late Henry Maund, M.D., both old students of the University College Hospital. On one occasion in particular, I remember these two and several other old friends and fellow-students, including Dr. William Squire, meeting at my father's house. Among other reminiscences, the first operation under ether was described at considerable length, each man taking part in it. This made a great impression on me, and it is from the recollection of this talk that I drew this account, modifying it only from the authorities already quoted. (b) Received from Mr. Peter W. Squire, who told me what his father had repeatedly narrated to him. (c) A communication from Dr. Barton, of Kensington, giving the Sheldrake incident, which had been told him by his father, who was present on the occasion.
11. Essays and Addresses of the late Sir J. Russell Reynolds, 1896.
12. "Companion to the British Pharmacopoeia," Squire's, various editions.
13. *Transactions of the Medico-Chirurgical Society,* 1847-48.
14. R. S. Surtees' "Hawbuck Grange," late edition. This book has a preface dated October, 1847. On pp. 176-77, Tom Powles observes: "I see the Sessions are coming on and they are advertising for people to send instructions for indicting prisoners. I wish some one would send instructions for indicting the weather. *Talk about ether, for cutting folk's heads off them when they're asleep without hurting of them. I wish they'd etherise me and let me sleep during a frost.*" Surtees was, of course, the author of the immortal Jorrocks, and the above is perhaps the first reference to ether anesthesia in general literature.

19 RANDOLPH ROAD, MAIDA HILL, W.

THE USE OF MUSIC IN LOCAL AND GENERAL ANESTHESIA.*

W. P. BURDICK, M.D.,
KANE, PA.

A brief letter which appeared in the correspondence column of the *Journal of the American Medical Association,* issue of June 6th, 1914, and signed by Dr. Evan O'Neil Kane, of Kane, Pa., was productive of rather interesting results. The letter referred to the use of a phonograph in operating rooms; and the new idea was so opposed to the fixed ideas on the subject of operative procedure that paragraph writers, and some doctors, used it as a safety valve for their pent up wit. Their attitude demonstrated once more the fact that the introduction of any new thing is sure to arouse the skeptic from the lethargy that sometimes overtakes him.

The suggestions which were made by the humorists as to the musical selections which would please them most, and be best adapted to the case when about to go *under the knife,* brought out an important principle which it is absolutely necessary to make use of in the successful adoption of music as a means of mitigating the dread of operations. If Mankind were always consistent, the idea of suitable music as an accompaniment to surgical clinics would seem entirely rational.

Theology teaches that the person who lives up to the principles of Christianity in this life passes, at death, to a higher, nobler and far happier existence; and yet, as practically all concede that *no traveler* has yet returned to verify these statements, even the most faithful Christian may be excused if at times there is a slight wavering of faith when facing dissolution; and an expressed willingness to bear, for awhile longer, at least, the ills they have.

But modern surgery offers to suffering humanity not only hope, but statistics. Few, indeed, are they who do not know that the skilled surgeon of to-day is able to eliminate most of the very worst afflictions that affect the human race; and that in the great majority of cases those who submit to surgical interference are restored to health, and a life of usefulness.

Assuming that the patient is free from mental bias, and is capable of taking a common-sense view of the situation, the fact that he or she is about to be relieved in one brief hour of some abnormal growth or condition that time and medicine could not cure, and which has caused years of suffering and abject misery—this fact should cause great rejoicing. Instead, however, the patient is usually bidden a tearful farewell by the family and friends, and enters the operating room atmosphere often with such feelings of horror and dread as to be on the verge of collapse.

By *operating room atmosphere* I mean the demeanor and low professional tones of the surgical staff, the expressionless faces and whispers of the nurses, or an almost complete silence that is quite often harshly jarred by the rattle and banging of instruments. Realizing that these things are wrong in practice as well as in theory, we have, at the Kane Hospital, been endeavoring in some manner to break away from them, and surround the patients with more natural conditions—the more effectually to reassure them, and dispel their fears.

The installation, then, of a phonograph accompaniment to our operative work in the operating room was not a mere erratic experiment. It was suggested as a result of experience with appeals to the musical sense among individuals elsewhere. For some time a phonograph had been employed in the wards of the hospital as a pastime for the sick. It was operated by those who were able to be up out of bed for the diversion of the less fortunate. These, with but few exceptions, took great delight in it. It was observed that even the most serious cases did better while the phonograph was in operation, although it was kept going continuously from early morning until after nightfall.

Though it had been objected that the instrument would interfere with sleep, this was not the case. Quite the reverse. Even recently operated cases, from the time of entrance into the wards, and while still coming out of the anesthetic, would be beneficially influenced. Fully 95 per cent. of all patients expressed a desire to hear the phonograph, and of the remaining 5 per cent. not more than about 2 per cent. made any serious objection.

The striking facts above mentioned pertaining to the salutary influence of this instrument suggested to Dr. Kane and myself the idea of utilizing music as a diversionary means during operation under local analgesia. A phonograph was installed in the operating room, and pieces, instrumental and vocal, suited to the taste and temperament of individual cases, were selected.

My present method is to visit the patient on the evening before the morning of the operation, and in a little *heart to heart* talk I try to impress the fact that what is to be gone through with in the morning is by no means to be considered a trying ordeal. They will not suffer or be made uncomfortable in any way, but, in all probability, will be relieved of

* Read during the Organization Meeting of the Inter-State Association of Anesthetists, in Cincinnati, May 4-5, 1915.

their affliction. I state that so far as considering the operation a grave affair (and by grave, in this case, I mean the opposite of gay), we look upon it with such cheerfulness that we frequently have a little music while operating. I learn the patient's nationality, and the degree of fondness for music; and when the subject is brought into the operating room to be placed upon the table, the machine—*muffled*—is playing in subdued tones some piece the patient had previously expressed a liking for.

There never has been any feeling of hilarity, for I think we all feel as did Jessica in The Merchant of Venice when she said: *"I am never merry when I hear sweet music."* We soon adapted ourselves to the innovation, and had no feeling that it was out of harmony with, and unsuited to, the occasion.

The effect has been highly satisfactory. In practically all cases the patients were attracted by the songs and instrumental music, and were diverted from the operation from start to completion. It was no longer necessary to keep myself or assistant engaged in conversation with the patients to divert them. They had enough to occupy them. At points in the operation when the surgeon had to block a nerve, drag upon a viscus, or explore a peritoneum beyond the obtunded area, a sign from him was sufficient, and the attention of the subject was called to some tone, strain, musical theme or turning in the concert. Thus, without breaking the harmony of the operating room technique, the good offices of the *great god Pan* were invoked and gratefully accepted.

Next, is was suggested, from the pleasure the ward phonograph gave patients being prepared for operation, that the instrument be set in motion as the patients were being brought into the operating room to be put under general anesthesia, in order to antagonize the feeling of fear and horror so common during this distressing phase of the operative ordeal.

About this time, also, my attention was attracted by the remark of a female patient while *going under* gas. Our operating room is situated in the top of the building—four stories above the noise, dust and odors of the street. On the first floor is a large parlor; and on this occasion the soft strains of a piano floated up through the corridors from this room, and faintly penetrated the operating room. After two or three spasmodic whiffs of gas the patient said, in tones of extreme satisfaction: *"Oh! I hear a piano. How sweet, and far away it sounds;"* and immediately I observed that the tension was gone; the breathing at once became regular, and the patient quietly, and rapidly went to sleep.

We then placed the instrument just outside the room for general anesthesia, with the tones always muffled, and it served the purpose well; for we observed that the anesthetic was almost invariably taken more calmly, and with less tendency to resist the earlier inhalations than formerly. Also, and this was of no small importance, if the action of the machine was resumed for a few minutes as the patients were recovering consciousness, they were thereafter deluded into a dreamy idea that they had heard the strains of music from start to finish, without break in their connection; and consequently, had escaped all operative interference, the cure effected having been as it were extraneous to any operative procedure; *"lifted to Heaven," "translated," borne to spirit land," "to limbo,"* and other and similar expressions being frequently used.

Not all patients could, as has already been suggested, be treated with the same instrumental, or vocal themes. Temperament, education, religious training, and other psychic influences, as well as racial tendencies, have all had to be considered in making a real live success of this novel procedure. Otherwise it would be worse than a failure. The instrument, too, must be no *hand-me-down,* but one of the best; and only high-class music may be employed.

A few who are not benefited by the *song-world trance,* as Dr. Kane (desiring to keep pace with modern nomenclature) aptly puts it, make known their indifference to its charms so promptly, and with such emphasis, that there is no difficulty in discovering their deficiency in this respect, and the concert is brought immediately to a close, without further parley, and no injury is done.

Finally, all good doctors are lovers of art, and good music appeals to their refined natures. It therefore acts as a soothing medium for the operating staff during a long, harrassing operation; and by lessening nerve strain and anxiety, conduces to better work—thus scoring another gain for the patient.

406 CHASE STREET.

FEATURES IN THE OCTOBER ISSUE

INTRATRACHEAL ANESTHESIA
(Illustrated)
B. MERRILL RICKETTS, M.D., F.A.C.S.
Cincinnati, Ohio

ANESTHESIA FOR BRAIN SURGERY
(Illustrated)
CHARLES K. TETER, D.D.S.
Cleveland, Ohio

NITROUS OXID IN OBSTETRICS.*

A CONSIDERATION OF THE TECHNIC OF APPLICATION

ARTHUR E. GUEDEL, M.D.,
INDIANAPOLIS, IND.

In previous reports on this subject I have felt that it was necessary to spend considerable time in comparing nitrous oxid with ether and chloroform in order to emphasize the advantages of this gas in obstetrics.

I am assuming, however, in this report, that my readers are men quite alive in anesthesia, and inasmuch as I have dicussed this question in previously published reports, and it has recently been excellently considered in publications by Drs. Lynch and Webster, of Chicago, and Dr. Allen, of Brooklyn, and others, there is no need to dwell upon it here.

The application of nitrous oxid in labor has advanced to the point where it has become the general anesthetic agent of choice. I shall proceed immediately to a brief consideration of the technic of application.

As a result of experience with various methods I have formulated the following classification from which to choose:

1. *Analgesia; individual pain application; the patient holding the inhaler.*
2. *Analgesia; individual pain application; an attendant holding the inhaler.*
3. *Analgesia; continuous application; the patient holding the inhaler.*
4. *Analgesia; continuous application; an attendant holding the inhaler.*
5. *Anesthesia (light but complete narcosis); individual pain application; the patient holding the inhaler.*
6. *Anesthesia; individual pain application; an attendant holding the inhaler.*
7. *Anesthesia; continuous application.*

Before considering these methods separately there are two general questions to be discussed covering them all:

(1) Is pure oxygen necessary as a diluent to nitrous oxid? There is no manifest difference between gas oxygen analgesia and analgesia secured with gas and atmospheric air. The character of analgesia and its depth, depend upon the anesthetic agent. Oxygen, of course, is necessary but the quantity of this gas available from atmospheric air is sufficient to support proper oxidation of the body tissues in analgesia during any period of time.

As for individual pain narcosis the period of anesthesia here is so short that there is no need for the application of pure oxygen. In the last named classification: *Continuous Anesthesia,* oxygen, of course, has a decided advantage over air as a diluent, but as continuous anesthesia for any period of time is rarely needed in obstetrics, I have discarded the oxygen cylinder from my outfit and am depending entirely upon gas and air. To use pure oxygen is to complicate the apparatus and the technic of manipulation. Also air is always available at a very low cost.

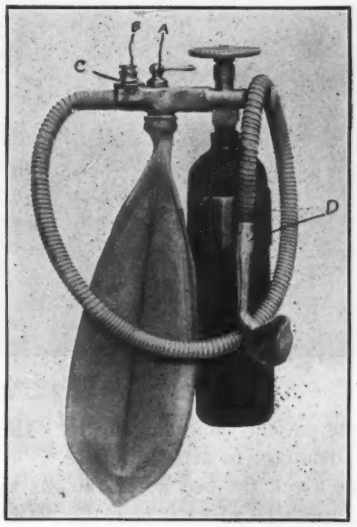


Fig. 1. The author's simplified apparatus for the self-administration of obstetrical analgesia. (A) Stopcock to control the flow of gas from the supply bag to the inhaler; (B) Expiratory valve to regulate the quantity of the gas mixture rebreathed; (C) Valve to regulate the quantity of air mixed with the gas; (D) Hollow aluminum handle by which the patient holds the inhaler. NOTE: All valves are back of the inhaler. By this arrangement the operator can make any adjustment desired without the patient's knowledge of the change.

(2) Why the self administration method? I am using this method because in most cases it is entirely efficient. Its various advantages I have discussed at length in previous published reports, but a brief review here will do no harm.

This method is absolutely safe. It is difficult to conceive the possibility of accident with the patient holding the inhaler. It renders unnecessary the calling of an anesthetist for every normal labor. It is only in the technical or more difficult obstetrical operations that I have found it necessary to call an anesthetist. Ordinary low forceps delivery, perineal repair, and such usual operations are accomplished as a rule without any inconvenience. Occasionally a patient is found who will not hold the inhaler properly, in which case, an anesthetist is called. Patients have no fear of this method. Also,

* Read during the Organization Meeting of the Inter-State Association of Anesthetists, in Cincinnati, May 4-5, 1915.

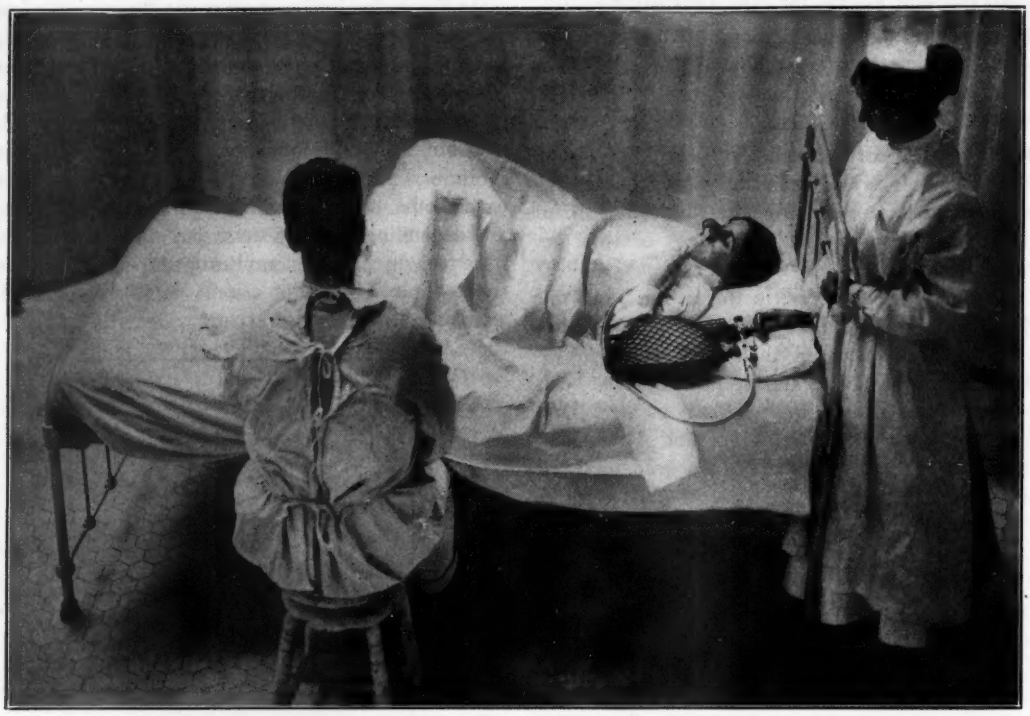


Fig. 2. The Self-administration of obstetrical nitrous acid analgesia in use.

it gives the patient something to do. This last is of great advantage in actual practice.

Any one about the bed keeps the gas bag filled. With the approach of each pain the patient places the inhaler to her nose and breathes deeply the mixture of gas and air, dependent upon the state of analgesia or anesthesia desired. In short complete narcosis pure gas is admitted. In analgesia the gas is mixed with from twenty to fifty per cent. air or more. The patient will maintain in this way continuous analgesia. If narcosis supervenes the inhaler is usually dropped quietly an inch or two away from the nose and recovery, requiring from ten to thirty seconds, immediately occurs.

Now to take up individually the various methods under the above classification: 1. *Analgesia; individual pain application; the patient holding the inhaler.* The apparatus is adjusted to deliver the mixture of gas and air desired, the amount of air to be determined individually for each case. The gas bag is kept filled and as the patient places the inhaler to the nose, indicating the approach of a pain, gas is released from the bag through to the inhaler. The patient breathes until analgesia is sufficient to render the pain bearable and as the pain passes she is directed to remove the inhaler. Not infrequently a patient is found who refuses to remove the inhaler when told to do so, for fear that the next pain will catch her unprepared, in which case, unknown to the patient, the gas is turned off and air substituted. Economy must not be forgotten. This is the method of first choice and in most cases it is entirely satisfactory.

2. *Analgesia; individual pain application; an attendant holding the inhaler.* The apparatus is regulated to deliver the desired mixture and in the absence of an anesthetist, the nurse holds the inhaler subject to the operator's directions. As the patient shows evidence of approaching pain the inhaler is placed over her nose and she is instructed to breathe deeply four or five times, after which her respirations settle to slightly above normal. It is not difficult to determine the passing of the pain, at which time the inhaler is removed.

3. *Analgesia; continuous application; the patient holding the inhaler:* It is advisable toward the end of labor when the pains are seemingly piling one upon the other, to permit a state of continuous analgesia. I insist that the patient hold the inhaler until she has proven her inability to do so. This occurs at times with nervous individuals, and in these cases the inhaler as well as the patient must be held by the attendant. The only advantage of intermittent analgesia over continuous analgesia is that it requires less gas.

4. *Analgesia; continuous application; an attend-*

ant holding the inhaler: This applies only in cases which cannot be controlled by the self-administration method. The inhaler is placed, and a mixture of gas sufficient to produce analgesia, with air sufficient to maintain a normal color, is admitted. Hysterical patients do not themselves hold the inhaler satisfactorily.

5. *Anesthesia (light but complete narcosis); individual pain application; the patient holding the inhaler:* In certain cases analgesia will be found not sufficient to control the pain, and anesthesia is permitted. This anesthesia is brought about in the following manner: Pure gas or gas with from five to ten per cent. air is delivered to the patient. She is instructed to hold the inhaler to her nose and coached to hold it there as long as possible. The inhaler is removed either by simple muscular relaxation with the onset of light anesthesia or by the first jactitory spasm. In some patients this jactitory spasm occurs with the first change in color. In others it is preceded by considerable duskiness. Little attention is paid to slight duskiness. However, where the discoloration is too apparent, although it is quite evanescent, I increase the air, in order to allay the anxiety of relatives at the bedside. Particularly in the earlier cases, dispensary cases, on which this gas was first tried out, the mother would repeatedly during labor be rendered quite cyanotic with frequent anoxemic muscular spasm. Very soon, however, this was found to be unnecessary, a lighter degree of anesthesia with no cyanosis and spasm being found quite sufficient to control the pain.

6. *Anesthesia; individual pain application; an attendant holding the inhaler:* This requires a good anesthetist with emphasis upon the word *good*. Anesthesia is induced slowly or rapidly dependent upon the character of the pains, the idea being to bring about complete anesthesia just in advance of the acme of uterine contraction. The inhaler can usually be removed at once and anesthesia will outlast the pain. I am in doubt as to whether this method should be placed sixth or seventh in our choice of methods.

7. *Anesthesia; continuous application:* I have in a number of cases successfully maintained continuous anesthesia in labor with gas and ordinary atmospheric air. This, however, is not to be recommended for general use and better results are obtained with gas and pure oxygen. However, continuous, complete narcosis is rarely required. When it is necessary, an anesthetist should be called. There is no difference between this anesthesia and that usually applied in general surgery, with the exception that labor requires only a light degree of anesthesia.

The general technic varies with the individual case and the stage of labor being dealt with.

The time of administration depends entirely upon the degree of suffering. No unfavorable results have been noted even though the gas has been administered for periods up to six or seven hours. The average period of anesthesia necessary is from one to two hours. As the head passes over the perineum deep analgesia as a rule is sufficient. Anesthesia may be permitted. Delivery can be made slowly and deliberately. The head can be hung in the perineum until the vaginal orifice is completely dilated and ideal delivery between pains accomplished. During this period although analgesia is sufficiently deep to render the suffering negligible, yet the patient responds to suggestions from the obstetrician to *bear down* or *rest* as may be required.

I am not in position to compare the frequency or perineal laceration with nitrous oxid and ether, but I am quite sure that laceration is less frequent with nitrous oxid than with no anesthesia at all, this because the perineum may be manipulated at will. All perineal repair is usually done with the same method of anesthesia as was employed in that particular case.

In conclusion I wish merely to state that nitrous oxide is without doubt the best anesthetic agent for use in obstetrics that we have to-day. The technique may vary with the operation, but the one principle must hold in all cases, namely, that enough nitrous oxid be given to ally the suffering, with enough air or oxygen to maintain the respiratory balance of bodily tissues.

ABSTRACT OF DISCUSSION.

Dr. C. E. Turner, Columbus, O.: In discussing nitrous oxid analgesia in obstetrics, I must emphasize the fact that its merits can only be appreciated by those who have applied it to a number of scientific tests. While the rabid antagonists of nitrous oxid in surgery claim that you cannot get full relaxation from the administration of this anesthetic, this is just the feature that appeals to the obstetrician. The mechanism of labor demands the preservation of muscular tonicity in the abdominal muscles, to assist and increase the expelling force of the gravid uterus.

Gas-oxygen analgesia offers many advantages. (1) A uniform relaxation of the pelvic floor, with consequently fewer lascerations; (2) a shortened second stage of labor; (3) normal babies and placid mothers; (4) a rapid return of the patient to full possession of her faculties.

Gas-oxygen analgesia for labor is easily administered, though I have never practised the self-administration method of Dr. Guedel, always employing an expert anesthetist. The mixture of the gases must be adapted to individual cases. We have been able to produce analgesia with percentages as low as 50 per cent. gas and 20 per cent. oxygen; while others have required at high as 70 per cent. gas and 30 per cent oxygen.

While analgesia is contraindicated in puerperal eclampsia, placenta previa and contracted pelvis, nitrous oxid-oxygen *anesthesia* is indicated for these complications.

The claim that babies born under gas-oxygen analgesia require pulmotor resuscitation, is not true. If oxygen perflation is required, the oxygen is at hand for any emergency. As a routine, we preceed gas-oxygen analgesia with one ampoule of La Roche scopolamine; but do not repeat the dose. The gas is substituted for the morphia. In over 100 cases in the personal experience of Allen of Brooklyn, Skeel of Cleveland and myself, we have had no infant mortality and a clean record for the mothers.

In conclusion, if the analgesia is handled by an expert anesthetist, and the delivery by an experienced obstetrician, the method is ideal for not only routine labors, but also all possible obstetrical complications.

717 HUME-MANSUR BUILDING.

FIFTEEN YEARS' EXPERIENCE WITH ETHYL CHLORIDE AS A GENERAL ANESTHETIC.

MARTIN W. WARE, M.D.,
NEW YORK CITY.

Somewhat more than fifteen years ago I first essayed the use of ethyl chloride as a general anesthetic for operations of brief duration, and embodied my earliest experiences in several communications in 1901.[1 2 3] Since that time I have had administered under my personal direction as many as 15,000 narcoses. By far the larger number of these have been in the ambulatory practice of the Surgical Service of the Good Samaritan Dispensary. Here, also, colleagues in other departments have repeatedly, after entering the service of this institution, followed my example in availing themselves of the facile and safe method of ethyl chloride anesthesia to the exclusion of nitrous oxid. So if numbers could carry conviction, I could rally authentic statistics, doubling those from my own personal experience. As both nitrous oxid and ethyl chloride were at our disposal, the choice of the latter was wholly voluntary and unbiased. The first fatality—yet to come—might have called forth censure from the Dispensary authorities, perhaps even a prohibition of its use; but should this ever impending incident now occur, we are well fortified against such an injunction by virtue of the large number of its successful administrations. I am emphasizing this point to disclaim for myself a death from ethyl chloride which has erroneously crept into the literature, because I had figured the mortality in 1903 at one in 15,000.

Those imbued with the slogan of the day, *safety first*, should consult the ethyl chloride mortality statistics in recent text-books on anesthesia. But more paramount than mere statistics, and what is more vital to the survival of ethyl chloride as a general anesthetic, is the criticism I propose of the assigned mortality. Not that its low mortality does not place ethyl chloride on a plane of safety parallel with other anesthetics, but because a due appreciation of the capricious errors that have entered into a consideration of the subject will tend to place the estimate of its uses and safety still higher.

Thus the earliest reported death followed many hours after a kyphotic patient, a previous hemiplegic, had had a tooth extracted and walked home.[4] The mortality from British sources, published by MacCardie[5] and Luke,[6] must alike be challenged as not at all relevant and certainly immaterial. The former says: *"I have seen neither asphyxia nor syncope in my personal experience of 2,000 cases,"* and then instances eight fatalities from other sources. Most of the deaths reported bear the hall marks of inexperience attaining ludicrous proportions, as for instance, the last case cited as follows:

Case 1: During the removal of adenoids and tonsils in a child, which necessitated tracheotomy, it is questionable whether ethyl chloride caused death. The surgeon thinks a piece of the growth fell into the larynx.

Equally incongruous is a death mentioned by Luke, in a child 12 months old, with diphtheritic obstruction of the larynx, when about to be tracheotomized! Perusal of the original of either author will reveal a number of such inconsequential deaths. In the same class I would put the much cited case in American literature:

Case 2: A colored man with strangulated hernia had vomited much preceding the anesthesia, which was started with ethyl chloride and progressed well. After three or four minutes ether was exhibited, followed by retching and continuous vomiting of an enormous quantity of clear fluid. In two or three minutes vomiting ceased; the patient became cyanotic, pulseless and died. No post mortem.

Lotheisen,[8] who really fathered ethyl chloride for surgical anesthesia, thinks that the high mortality of the British is wrongly saddled on the anesthetic itself, for as early as 1903, antedating MacCardie, Lotheisen gave it as his opinion that only in one out of seven fatalities reported was ethyl chloride in any manner responsible for death. In support of his contention he cites two lamentable instances:

Case 3: A man, 59 years of age, anesthetized with 5 c.c. of ethyl chloride, followed by C. E. mixture, suddenly became pulseless and died. Post mortem examination revealed carcinoma of the prostate and metastases in the lungs.

Case 4: Death twenty-four hours after ethyl chloride anesthesia. Operation, gastro-enterostomy with resection of the pylorus.

In 1908 W. Estel Lee[9] likewise comments on *the varied difference of opinion as to fatalities under ethyl chloride anesthesia, and believes that there may be other elements present, independent of the anesthetic, which may be responsible for the mortality.* Then Lee, mindful of these errors, contributes 4 deaths, all in negroes to whom ethyl

chloride was exhibited, and in each case the surgical condition per se was sufficiently desperate to account for the fatality. Lee attributes these deaths in negroes to the difficulty of recognizing imperiling cyanosis. In discussing this paper Dr. J. Gibbon [10] says Dr. Lee has shown how superlatively statistics can deceive. Speaking for himself, Dr. Gibbon had used ethyl chloride anesthesia for short operations, during six years, with impunity. The one death reported in his thousands of cases occurred during an ether sequence in a case of Angina Ludovici complicated by endocarditis.

Case 5: In this case Schleich's infiltration was a failure owing to the depth of the exudate in the neck, and the painful manipulation necessitated a change to ethyl chloride-ether. Immediately following the evacuation of the pus behind the sternum, and a few minutes after discontinuation of the ether, the patient ceased breathing. Tracheotomy and artificial respiration were unavailing.

A. H. Miller, in 1908, [11] reported 6,648 cases of ethyl chloride anesthesia with a death occurring in the course of an appendicitis operation, for which he blames the inexperienced administrator. Furthermore, Miller collected 43,796 cases with five deaths, thereby computing an average mortality of 1 in 8,759.

In 1910 an arraignment of ethyl chloride anesthesia appeared from the pen of H. C. Wood,[12] under the title, "The Comparative Danger of Ethyl Chloride," which purported, by carrying the endorsement of the Committee on Anesthesia of the American Medical Association, to be more authoritative and less arbitrary. As a matter of fact it was neither. With Miller's figures as the point of departure, Wood endeavored to give a true actuarial interpretation of them in pointing out that 8 deaths were not credited to MacCardie, nor should they be, for these deaths had already been assigned to their original sources. To do so would have been repetition and would have constituted an actuarial error greater than the assumed juggling of figures by Miller. The balance of the strictures against ethyl chloride, which Wood himself characterizes as unduly harsh, are based merely on *profound conviction,* not born of actual trial and the implication that inexperience and untrained physicians and dentists are responsible for the fatalities. In all this there is manifested a lack of a due sense of proportion.

No one actually conversant with the use of ethyl chloride has condemned it nor damned it with faint praise. Shortcomings arising from the inexperience of the anesthetists should not be charged against the anesthetic agent. This is fundamental and obtains for the use of all lethal agents. Witness the following endorsements of those who speak from experience.

Dr. M. J. Seelig, wholly familiar with nitrous oxid, substituted ethyl chloride for it [13] because it is practically as safe, induces quicker anesthesia, and causes no cyanosis or asphyctic symptoms. Gaudiani [13] asserts that not one of the small number of deaths saddled on ethyl chloride was solely due to the agent itself.

In 1912 the *Medical Record* saw fit to single out for editorial comment, Malherbe's contribution,[14] of 6,275 cases anesthetized with ethyl chloride without a death, wherein he expresses the belief that it will be used for long operations and that it will ultimately supersede chloroform and ether owing to its greater margin of safety.

Not a little of the antagonism against ethyl chloride springs from its improper administration. MacCardie says that the deaths from British sources outnumber those on the continent, because the closed method of administration is used by the former, the open by the latter. This is the crux of the matter. A proper use of ethyl chloride calls for the same principles in administration as those used in giving the more favored anesthetics. A free admixture of air is practiced in a large degree when giving chloroform and to a lesser extent in the administration of ether.

The use of inhalers with rubber-bag reservoirs confines the volatized ethyl chloride, thereby reducing the quantity primarily used, always bearing in mind the free admixture of air in sufficient quantity, while to and fro breathing of the bag content, as with ether, favors a speedy and pleasant narcosis. When thus administered it is surprising how profoundly narcotized, completely anesthetized and thoroughly relaxed the subject becomes, after a brief preliminary and variable stage of excitement, more noticeable in neurotics and alcoholics. This safe and efficient narcosis may be continued at pleasure, and it is equally as astonishing to witness a recovery to complete consciousness within a few minutes, attended by such untoward complications as nausea and vomiting in exceptionally few instances, and seldom after proper preparation of the patient. The same degree of complete narcosis, attained with ether or chloroform, requires hours for recovery. With nitrous oxid pure or in combination with oxygen, no such relaxation is ever witnessed. The amount of ethyl chloride and the degree of anesthesia have to be gauged by the same criteria as any other narcosis and are too elemental to be described in detail.

In conclusion I would reiterate that I have endeavored to controvert the prejudice and bias against ethly chloride based on a misconception of

its proper administration and assumed mortality. Some of the deaths recorded have occurred under anesthesia induced by a combination of ethyl chloride with other anesthetics such as ethyl bromide and methyl chloride. Personally I have restricted myself to the use of the purest obtainable ethyl chlorides, such as Ethesia and Kelene, and have never had occasion to regret their use.

BIBLIOGRAPHY.

[1] Ware, M. W., Field for Ethyl Chloride, Medical Record, April 6, 1901.
[2] Ware, M. W., The Administration of Ethyl Chloride, Medical News, August 3, 1901.
[3] Ware, M. W., 1,000 Personally Conducted Cases of Ethyl Chloride Anesthesia, Jour. A. M. A., November 8, 1902.
[4] Seitz, Chlorethyltod. Cor. Beit. fur Schweiz. Aertz. Yahr. 31, p. 97.
[5] MacCardie, Position of and Mortality from Ethyl Chloride, British Med. Jour., 1906, p. 616.
[6] Luke, Twenty-two Fatalities under Ethyl Chloride, British Med. Jour., 1905.
[7] Allen, Annals of Surgery, Vol. 48, p. 644, 1908.
[8] Lotheisen, Ethyl Chloride, Archiv. fur klin. Chir., Bd. 91, Ht. 65, 1910.
[9] Lee, W. E., Uses of Ethyl Chloride, Annals of Surgery, Vol. 48, p. 641, 1908.
[10] Gibbon, Trans. Phil. Acad. Med. Annals of Surgery, Vol. 48, p. 795, 1908.
[11] Miller, A. H., Ethyl Chloride as a General Anesthetic, Boston Medical & Surg. Jour., p. 643, 1909.
[12] Wood, H. C., The Comparative Danger of Ethyl Chloride, Jour. A. M. A., Vol. 55, p. 2,229, 1910.
[13] Seelig, M. J., Annals of Surgery, Vol. 42, p. 185, 1905.
[14] Gaudiani, Ethyl Chloride Narcosis, Riforma Medica, Jan. 29, 1904.
[15] Malherbe, Medical Press and Circular, May 3, 1911.

27 East 81st Street.

ANESTHESIA—A FULL-FLEDGED SPECIALTY.*

WILLIAM HAMILTON LONG, M.D.,
LOUISVILLE, KY.

The present age is essentially one of specialization in all things; and in no field of human activity and endeavor is this tendency more marked than in our own profession, and for the best of reasons. So rapid has been the advance of medicine in the past quarter century; so spectacularly have achievements followed discoveries in all the theory and science of that symptom-complex we call the *Practice of Medicine*, that any physician, however studious, who would acquire a comprehensive understanding, not to say practical working knowledge of medicine in all its branches, must perforce throw up his hands in despair. Thus specialization has come as the natural, logical and only feasible solution.

We have the surgeon, urologist, dermatologist, internist, pathologist, opthalmologist and others; even divisions and subdivisions of these. Why, then, should not the anesthetist, equipped and specially trained for his work, step up and take his place with the others, bringing to his specialty and demanding for it the same dignity and standing that is freely accorded theirs? The time is ripe for anesthesia to come into its predestined birthright and for the anesthetist to be accorded the same status extended to his confreres in the older, established specialties.

While many among us can remember when anyone present was called upon to give the anesthetic and no skill or training in its administration was thought of, and previous experience was deemed unnecessary, yet no one can but approve the change that is in the making, and though recognizing that great strides have been made, we must still work for the further and fuller recognition of anesthesia as a full-fledged specialty, and the elimination of certain abuses that have crept into its practice.

Primarily the anesthetist should be a consultant, and it should be within his province, after examining the patient and familiarizing himself with the history of a given case, to decide on the preliminary preparation for as well as the anesthetic and method of its administration to be employed. In short, the duty of the expert anesthetist should be not only to administer the anesthetic safely and satisfactorily, but also to so prepare the patient for the operative ordeal and so manage the post-anesthetic recovery as to obviate any and all of the possible sequelæ that not only endanger life, but make the postoperative recovery unpleasant. The conscientious anesthetist, who is an expert, is not only able but willing to assume this duty and its inherent responsibilities; but until it is conceded that he must answer up to these requirements and fulfill these obligations, his position will remain that of a subordinate on the operating staff.

The average surgeon knows little about anesthesia, and cares less. Only exceptional surgeons or specialists realize what team-work between operator and anesthetist can accomplish, not only for the patient's welfare, but their professional reputations as well. While some surgeons have a profound scientific knowledge of anesthesia, they can no more put themselves in the place of the practical and expert anesthetists, who by long experience has learned to sense certain things in connection with his daily work, than could the anesthetist replace the operator and intuitively master the surgeon's technic. Dictation as between surgeon and anesthetist regarding their respective technics is simply subversive of the patient's ulti-

*Read during the Organization Meeting of the Interstate Association of Anesthetists, in Cincinnati, May 4-5, 1915. (Chairman's address.)

mate chances of recovery; not that a thorough understanding of the anesthetic technic to the surgery involved is not a very desirable thing, and a decided element in promoting operative efficiency. While surgeon and anesthetist must each remain supreme in his own domain, their joint results will be gauged by the intimacy with which they cooperate their skill, judgment and sympathy.

The technical ability to skillfully administer anesthesia is by no means the greatest asset of the expert anesthetist; and the anesthetist of whom nothing more is required, whose judgment, ideas and opinions are not sought, becomes a mere automaton. Such routine drudgery, in this day of refinements in anesthesia, does not appeal to the type of man who has the makings of an expert and who should be encouraged to develop anesthesia into a full-fledged specialty.

The practice of permitting non-graduates to administer anesthesia is greatly to be deplored, and it should be one of the first efforts of recently organized associations of anesthetists to discourage and eliminate this evil. The mere moral effect of such associations, composed of reputable, licensed graduates, striving enthusiastically to further the science and practice of anesthesia and devoting their time and talent to establish anesthesia on the same plane as the older specialties, should go a long way toward eliminating the nurse anesthetist evil. However the letter of the law may be met by those hospitals and surgeons using trained nurses as anesthetists, by what technicalities the practice is made to seem legal, it is certain that the spirit and intent of all State Medical Practice Acts is violated. The question to be definitely answered is short and simple: *Is the administration of anesthesia and analgesia a part of the practice of medicine?* If so—and I think all will be forced to answer in the affirmative—then let us insist that henceforth anesthesia be administered only by duly graduated, licensed and, if possible, specially trained physicians. We need not hesitate to go on record as frankly and honestly opposed to the nurse anesthetist. However adept and skillful the nurse may become in the mechanical and automatic performance of her work—and it may be observed that the nurse is invariably used where a routine method of anesthesia is employed—she cannot, without the broad foundation of a general medical education, be equipped for the practice of this specialty as is the graduated, licensed, expert medical anesthetist.

The American College of Surgeons could do no finer thing for the advancement of surgery and anesthesia than to discountenance the non-graduate anesthetist, as a violation of professional ethics. This evil affects the morale of the profession and its relations with the general public quite as much as the "fee-splitting" surgeon. The two practices are equally wrong in principle and both are demoralizing and their continuation is unworthy of the high ethical ideals that have always governed the conduct of our profession.

Other specialties have met with and surmounted similar obstacles during their transitional periods from obscurity to assured recognition. Undoubtedly the nurse anesthetist evil will be eliminated by degrees through the moral suasion of our associations of anesthetists. Such at least is *"the consummation devoutly to be wished."* Regardless of the ethical problem involved, the employment of the nurse anesthetist is an economic affront to the skilled, expert medical anesthetist. Witness the efforts of the specialists in opthalmology to restrain the refractionists in various states from securing the right to practice without graduation or license. The relation of the non-medical to the medical or dental anesthetist forms a parallel problem which may eventually demand the same drastic method of settlement.

An official interpretation of the Medical Practice Acts on this point would be welcomed by all right meaning, law abiding hospitals and surgeons, as well as the medical anesthetists of this country, for if the practice is illegal it should be abolished, and if countenanced by the state laws, immediate efforts should be instituted to have existing Medical Practice Acts so amended as to revoke the privilege.

Aside from the legality of the practice, the nurse anesthetist who has acquired a reputation for expert administration can make a better career for herself by studying medicine forthwith, and she can increase the dignity of her work, make it pay better and command the full respect of the whole profession. While drastic action may become necessary as a last resort, I believe personally that this problem is adjusting itself, and hence, for the present I would council patience, while we see what moral influence our associations of anesthetists can bring to bear on its solution. While a legal precedent would settle the question definitely, our specialty can afford to await the verdict of the profession and the public at large as it becomes educated to the value of our services as experts. Our contentions are bound to be recognized and our demands acceded to because they are right in principle and practice and tend to the conservation of the patient's best interests and welfare, and that in the final analysis is the main consideration.

The recent advances in anesthesia are many; the various refinements, improvements and perfections of technic are such that with proper experience, knowledge and equipment, almost any patient can be more safely, satisfactorily and more comfortably anesthetized than formerly, by any expert anesthetist familiar with his specialty.

The enterprising surgeon has more than enough to do to keep pace with the advances in his own specialty without attempting to familiarize himself with all that is new and advantageous in anesthesia and analgesia; nor can he be expected, in addition to the exigencies of the surgical procedure, to supervise the anesthetic phases of the operation, the preparation of the patient, the selection of the agent and the choice of technic, which may necessitate a change in the very midst of his work. Nor can his surgical judgment be at its best when of necessity he supervises both procedures—the operation and the administration of the anesthetic.

It is equally as unreasonable to expert anesthetic judgment, skill and efficiency of the newly graduated intern, who has had practically no instruction in anesthesia or analgesia while in college. The surgeon does not expect of the intern skill in *x*-ray work or pathology, for he relies on an expert Roentgenologist and pathologist for data upon which to base his diagnoses; and on their findings and their interpretation largely depends the decision of what surgery is possible, advisable and necessary in a given case. Why, then, have so few surgeons and hospitals expert anesthetists? Why jeopardize the best interests of the patient by anesthesia administered by nurses or interns, without the education, experience or training for the work, when this phase of the operative procedure, in the majority of instances, involves a greater risk of life than the surgical procedure itself?

If the administration of anesthesia were not looked upon as a trivial matter by the majority of surgeons and hospitals, and if the expert anesthetist were accorded the same recognition as a consultant as are the men in all other specialties, there would be no *anesthesia problem* for solution. The Report of the Anesthesia Committee of the American Medical Association (1912) handles this phase of the subject briefly and to the point.

"Every hospital, certainly every large hospital, should have as a regular member of its staff an attending anesthetist, whose authority in his special department should be as complete as is that of the attending physicians in theirs."

This is the solution of the anesthesia problem as it affects hospitals. To the surgeon who finds this a perplexing question in his private work, there is no other ethical solution than the employment of an expert anesthetist, one in whose judgment and ability he has implicit confidence. By such an arrangement the surgeon makes good team-work possible, shifting to the anesthetist's shoulders all anxiety and worry as to the condition of the patient, leaving his own mind free to engage the exigencies of the surgical problems involved. Such team-work makes for better surgery, safer and more satisfactory anesthesia, and conserves the best interests of all patients operated on.

The ideal anesthetist is one who has properly trained and fitted himself for his specialty; who takes his work seriously and demands compensation commensurate with the skill required and the responsibilities assumed. That this type of anesthetist has arrived needs no better proof than our presence here to organize the Interstate Association of Anesthetists, to do which we are giving lavishly of our time and have come hundreds of miles. In organizing we believe that the occasional anesthetist as well as the tyro who *"gives a few anesthetics to help along while getting a start,"* are of the past and that the non-medical anesthetist soon will be. We believe in the dignity and importance of our work. We believe that anesthesia should be taught in all halls of medicine, and in the operating rooms of all hospitals, and that no one should attempt this work upon his own responsibility without previous instruction, theoretical and practical, as complete in this field as would be demanded of him in the fields of surgery or any other of its correlated specialties.

While this may sound utopian, and some one has said that *"Those who dream must live on dreams!"* still, those who dream long and hard enough usually make their dreams come true. Our work is three score years old, though our specialty is new. In this connection I submit that by far the greater number of improvements in technic, or newer methods of anesthesia and analgesia have been given to medicine and surgery by physicians and dentists working along these lines as specialists.

The same sentiment that incorporated the erstwhile London Society of Anesthetists as the Anesthetic Section of the Royal Society of Medicine is now leavening the medical profession in America, and once the public at large comes to an appreciation of the value of expert anesthesia, our work will be recognized as a full-fledged specialty.

STARKS BUILDING.

ETHYL CHLORID AS A GENERAL ANESTHETIC IN DENTAL SURGERY.

MAURICE GREEN, D.D.S.,
NEW YORK CITY.

Considering that nitrous oxid has been and still is the main anesthetic used by dental surgeons, it is not surprising that it is a very difficult matter to convince the profession that there is another anesthetic which, if properly administered, *equals* nitrous oxid in safety, and far *surpasses* it in many other respects. This claim I make for pure ethyl chlorid, which I have administered for the past 12 years, with the simplest of apparatus, in over 5,000 anesthesias, without any bad results whatever. Having perfected a safe, efficient and satisfactory method of administration, I entirely abandoned the use of nitrous oxid, and have never had any cause to regret doing so.

The criticisms and statistics advanced against ethyl chlorid anesthesia in current medical literature are usually the reports of casual observers, whose opinions are not entitled to a great amount of credence, and whose statistics are lacking in many essential details regarding the apparatus used, the amount of anesthetic administered and the previous condition of the patients. Moreover, the conclusions of competent anesthetists, medical and dental, controvert the alleged dangers of ethyl chlorid anesthesia by the preponderating evidence of thousands upon thousands of safe and uncomplicated narcoses.

Despite all efforts to advance the use of ethyl chlorid anesthesia, this method of narcosis has never been given the status it deserves in dental surgery. The surgical profession and many expert anesthetists, however, have found it an invaluable preliminary anesthetic for the induction of etherization and are using it extensively for that purpose and as an anesthetic of choice in minor operations, especially those requiring muscular relaxation.

While most dental operations are minor affairs, so far as risk of life is concerned, they are, nevertheless, exquisitely painful and most patients prefer to have them done under the beneficent influence of an anesthetic. Primarily, this anesthesia must be *safe; secondarily, efficient.* Likewise, a rapid induction and uncomplicated recovery are vital essentials. My personal experience has more than convinced me that ethyl chlorid anesthesia, properly administered, fulfills all these requirements.

Ethyl chlorid was used as early as 1848 as a general anesthetic by Hayfelder. It is a clear, volatile fluid, highly explosive and should never be administered near an open flame. This precaution is of great importance, as several severe accidents are on record, in which patients were severely burned, following explosions of ethyl chlorid sprayed on the gums for analgesia, and ignited by the use of the electric cautery.

For general anesthesia the automatic tubes, containing from 30 to 100 grammes, with a heavy spray, are the most serviceable, particularly when graduated to control the amount of ethyl chlorid used. It is also essential to use the purest obtainable product.

A simple apparatus for the semi-open method of administration suffices. It is composed of the original rubber face-piece of the Ware inhaler, to which is attached a right-angled tube, ending in a rubber bag to hold the volatized anesthetic and allow rebreathing. The ethyl chlorid is sprayed into the bag through a smaller tube, set obliquely into the angulated breathing tube. The administration is conducted as follows: Holding the inhaler in the left hand, it is carefully adjusted over the patient's mouth and nose to exclude the entrance of air around the edges. After several deep exhalations to inflate the rubber bag, the ethyl chlorid is gently sprayed into the oblique admission tube, the opening of which is then closed with the thumb for about six inhalations, after which the thumb is removed, and the spraying of the anesthetic repeated until the signs of anesthesia, relaxation, rhythmic or stertorous breathing supervene. Anesthesia of this depth suffices for extractions and other short operations. Anesthesia is deepened by the extent to which rebreathing is allowed, and air sufficient for all purposes of oxygenation is admitted by removing the thumb from the admission tube. For operations other than in the oral cavity, when the inhaler need not be removed, anesthesia may be continued for any length of time, as with chloroform or ether. For longer operations in the mouth, the nasal administration of ethyl chlorid with a DeFord inhaler must be used.

Induction of anesthesia is slowly accomplished, is not unpleasant, as ethyl chlorid has a sweetish odor, is not suffocating, and the transition to unconsciousness, in advantageous surroundings, usually occurs without any excitement stage.

While authorities differ somewhat on the physiological action of ethyl chlorid, the consensus of opinion now tends toward its being a cardiac stimulant. While the pulse diminishes in frequency under ethyl chlorid anesthesia, it becomes stronger

and as the anesthesia is continued there is a gradual return to a normal pulse rate. The higher centers are stimulated in most cases, a profuse perspiration frequently bathing the forehead. This militates in favor of the safety of the patient.

In routine administrations the pulse may be disregarded if a thin, flexible rebreathing bag is employed, and the rhythmical breathing of the patient is constantly observed. With a free air-way and no respiratory embarrassment, it is almost impossible to have any untoward complications.

During ethyl chlorid anesthesia cyanosis should never be present. If it occurs the anesthesia must be discontinued until its cause has been found and rectified. Probably the tongue has dropped back, or the pharynx is clogged with mucous and saliva. These untoward incidences are of unfrequent occurrence, and I can only recall one case personally in which anesthesia had to be discontinued to deal with impeded respiration. This was a surgical case in which it was desirable to avoid the use of chloroform or ether in a hazardous risk, and the anesthesia had to be prolonged. Such cases rarely occur in routine dental practice.

If ethyl chlorid anesthesia were complicated by post-anesthetic sequelae it could not be advantageously used in a busy office practice; and were its fatalities such as some authorities represent them, its use would be disastrous and have to be speedily abandoned, due to the publicity in the newspapers and medical journals.

In this connection, suffice it to say that 99 per cent. of my patients anesthetized with ethyl chlorid leave the office within ten minutes after the dental operation is over. While there is somewhat more nausea and vomiting after ethyl chlorid than following the use of nitrous oxid, I frankly admit it is of such infrequent occurrence and trifling severity that it should not overshadow the many other advantages of this method of anesthesia. Vomiting occurs in not more than 10 per cent. of cases, and its greater frequency is probably due to relaxation of the deglutary muscles, which under nitrous oxid are contracted, thus allowing the swallowing of blood and anesthetic impregnated mucous. This contention is borne out by DeFord, who in his "Lectures on Anesthesia" says: "Blood entering the stomach always causes nausea. The anesthetic should not be held responsible for nausea the result of swallowed blood."

Perhaps the greatest source of nausea and vomiting after dental anesthesia is due to the fact that patients coming for dental operations are seldom prepared in advance. The frequency of vomiting noted after ethyl chlorid anesthesia in dental practice is not so noticeable when it is used in surgical operations for which patients have been properly prepared.

As to contraindications to ethyl chlorid anesthesia: Age is no drawback, although children, as with all other anesthetics, are the best subjects, alcoholics and neurotics the worst. Ethyl chlorid anesthesia is dangerous in pathological obstruction of the air passages, but not as dangerous as other anesthetics. The position of the patient under anesthesia can be at the operator's convenience, although a semi or horizontal position is best when practical.

From personal investigation and experience I am absolutely convinced of the safety of ethyl chlorid anesthesia. In 1911 I collected 20,000 anesthesias (Ware 10,000, Pick 5,000, Green 5,000) with but a single fatality; and since that time these same observers have added many thousand more cases to the list. The method has been equally as successful in the hands of many other observers who have lacked the time or inclination to report statistics.

In 1903 Tuttle expressed himself as follows regarding ethyl chlorid anesthesia, as combining all the ideals of a perfect anesthetic: *"Safety; insensibility to pain; complete relaxation; ease of induction; rapidity of effect; freedom from danger and after-effects, and simplicity of administration."*

In 1904, A. F. Erdman said: "In a word, it is maintained that ethyl chlorid is a relatively safe general anesthetic exceedingly simple in its use, particularly pleasant to inhale, surprisingly rapid in both its action upon the body and its escape from it, and happily much less liable to unpleasant after-effects, which usually follow other anesthetics. The fact that over 30,000 successful anesthesias have been given should be enough to insure its favorable attention, and when one considers in addition all the operations for which it has been used, it is not surprising that some anesthetists do, and more surprising that some do not make use of ethyl chlorid."

DeFord in his "Lectures on General Anesthesia in Dentistry" (1908) says: "I consider ethyl chlorid in careful hands one of the safest of anesthetics. It, of course, has its limitations, and I think all fatalities reported have been due to carelessness, improper administration or attempting too prolonged an anesthesia."

Just previous to his retirement, Luke of Edinburgh reported that ethyl chlorid anesthesia had made enormous strides on the Continent, and was displacing nitrous oxid in minor operations and as a preliminary to general anesthetics.

As to the duration and scope of ethyl chlorid

anesthesia by the method described, I have personally maintained complete surgical narcosis with ethyl chlorid alone up to 1 hour and 15 minutes. The operative procedures have varied from dental extractions to abdominal sections and amputations. In all instances the anesthesia has been safe, efficient and satisfactory; the patient regaining consciousness very shortly after discontinuation of the anesthetic, with all after-effects reduced to a negligible minimum.

Compared with nitrous oxid, ethyl chlorid anesthesia requires a comparatively simpler and less expensive apparatus for its administration, and may be used with a paper cornucopia and some gauze or cotton in an emergency. Also with ethyl chlorid there is no imperiling cyanosis, no jactitation, no muscular contractions, no swelling of the tongue to obstruct the view or interfere with instrumentation. It is especially valuable in trismus from an impacted or unerupted molar, as under its influence the masseters relax and a gag may be inserted, whereas with nitrous oxid the muscular spasm is usually exaggerated.

Ethyl chlorid anesthesia is at least 50 per cent. cheaper than nitrous oxid anesthesia, which, under certain circumstances, is a vital consideration. It allows also a longer period of anesthesia, permitting a more deliberate operation. It is noiseless in its escape from the container.

Personally I consider the pure ethyl chlorid *safer, better,* and *less expensive* than substitute combinations marketed under various trade names. The added ingredients are a source of peril rather than a source of improved efficiency. The automatic, graduated tubes are also far less wasteful than the ampoules.

In conclusion I wish to say that *no* anesthetic is absolutely safe—merely relatively safe. The most essential factor in *safety first* is the skill and knowledge of the anesthetist, even with such anesthetics as nitrous oxid and ethyl chlorid. Statistics, unless overwhelmingly unfavorable, are of little value unless they represent the results of competent investigators, who have made a scientific and clinical study of the anesthetic agent and its method of administration.

The conclusions I have stated are the results of a personal use of ethyl chlorid anesthesia during 12 years' routine dental practice, with entire satisfaction and no fatalities or untoward complications.

27 East Eighty-first Street.

The Anesthesia Supplement has recently been made the *Official Organ* of the New York Society and Interstate Association of Anesthetists.

IN MEMORIAM.

Dr. D. C. McAllum, the first President of the Scottish Society of Anesthetists, died in Edinburgh, on February 26, 1915, at the early age of 51, after an operation for perforated duodenal ulcer.

The son of an Indian Army Surgeon, Dr. McAllum graduated in Edinburgh and after spending three years in general practice in the country, he settled permanently in Edinburgh and devoted himself exclusively to the specialty of anesthesia. For many years he held the posts of Anesthetist to the Royal Hospital for Children and to Chalmers Hospital. He was the only anesthetist attached to either institution, and year after year he fulfilled his duties there with great regularity, and was beloved of all his confreres and patients. In addition to his hospital work he conducted an extensive private anesthetic practice. His experience as a practical anesthetist was thus a very large one and it would probably be no exaggeration to say that his experience in the anesthetization of children was unique.

It may fairly be said of Dr. McAllum that he was inclined to be conservative in his methods. Recent developments in anesthesia with their more complicated and somewhat cumbersome apparatus did not appeal to him, and to the last, although he gave ether freely, he was to a large extent faithful to his first love, and was always ready to champion the claims of chloroform, in the safe administration of which he had acquired great skill.

He was University Lecturer on Anesthetics, and at the time of his death was engaged on an article on Chloroform for the new edition of the *Encyclopedia Medica.*

His loss, while deeply deplored by the Scottish Society of Anesthetists, is as much regretted by those who were his friends and loved him and by those who had experienced the beneficence of his skill and sympathy.

H. TORRANCE THOMSON, M.D.,
Associate Editor for Scotland.

Book Reviews

A carefully selected library is essential to a thorough knowledge of the science and practice of a specialty.

Anoci-Association. By George W. Crile, M.D., Professor of Surgery, Western Reserve University, School of Medicine, Cleveland; and William E. Lower, M.D., Associate Professor of Genito-Urinary Surgery, Western Reserve University, School of Medicine, Cleveland. Octavo of 259 pages with original illustrations, many in color. W. B. Saunders Company, Philadelphia and London, 1914. Cloth, $3.00, net.

The *First Edition* of Crile and Lower's Anoci-Association is already in its third printing, a rather remarkable record for a monograph; although its importance as a contribution to safety and comfort in operative procedures is sufficient explanation for not only the popularity of the book, but also the method. Tried out, as it has been, here and abroad, by progressive surgeons and expert anesthetists, it has received almost unanimous endorsement, and while some authorities may differ from Crile with regard to his enthusiasm over the *kinetic theory of shock,* nevertheless, even his critics use the principles of *anoci-association* in their operative procedures to the improvement of their statistics and the well-being of their patients.

This is evidenced in the current literature of the subject, and by the number of surgeons and anesthetists who are reporting their personal results with the method. Some enthusiasts, indeed, are crediting Crile with the greatest advance in anesthesia since its discovery. While this pendulum of approval will swing backward, it will only be to the position which will establish the permanent position of anoci-association in regard to surgical and anesthetic technic.

(*Continued on page* 121.)

American Journal of Surgery

QUARTERLY SUPPLEMENT of ANESTHESIA and ANALGESIA

Surgery Publishing Co.
J. MacDONALD, Jr., M.D., President and Treasurer
92 WILLIAM STREET - NEW YORK, U. S. A.

Original Articles, Clinical Reports and Experimental Researches on the Theory and Practice of Anesthesia and Analgesia, as well as pertinent Society Transactions, are solicited for exclusive publication in this Supplement.
Typewritten Manuscripts facilitate Editorial Revision and avoid errors.
Subscribers Changing Address should immediately notify the publishers of their past and present locations.
Half-tones, Line-etchings and other Illustrations will be furnished by the Publishers when Photographs or Drawings are supplied by the Author.

F. HOEFFER McMECHAN, A.M., M.D., *Editor*
Cincinnati, Ohio, U.S.A.

JULY 1915

EXPERT ANESTHETISTS AND ANALGESIA.

The results of any operation are materially enhanced for the surgeon and patient by general anesthesia administered by an expert anesthetist. Most up-to-date surgeons are already employing this expedient in their team-work, and those who do not are simply delaying their own progress.

While general anesthesia will undoubtedly remain a necessary accompaniment of routine surgery for all time to come, nevertheless analgesia is gradually coming into its own as the method of choice in certain selected operative procedures, or as a factor in anoci-association. The principal drawback to this method is the time consumed owing to the fact that the surgeon is accustomed to conduct his own analgesia. Now there is no reason why the expert anesthetist should not supervise the preparation of all analgesic solutions, and while the surgeon is washing up, infiltrate the operative field, and during consequent steps of the operative technic, inject the various tissues, pedicles and nerve requiring obtunding. By such team-work an almost incalculable amount of time can be saved and the surgeon is able to reserve his skill, judgment and strength for the operative technic, instead of being continually distracted by the details of the analgesia.

Certain dental anesthetists are already co-operating in this manner with oral surgeons by conducting analgesia for their operative procedures, with eminent satisfaction to all concerned.

In this connection a word to the wise should be sufficient. There is no reason why the expert anesthetist should allow the conduct of analgesia to become a perquisite of the surgeon, when study, experience and proper persuasion will enable him to retain it as a vital part of his own specialty.—F. H. M.

THE AMERICAN COLLEGE OF SURGEONS AND UNLICENSED ANESTHETISTS.

The drastic attitude of the American College of Surgeons toward *fee-splitting* loses much of its force in view of the fact that the organization permits some of its most prominent members to continue the routine employment of unlicensed anesthetists.

If anything can be such the administration of an anesthetic is certainly a medical act, and as such should be duly limited to licensed practitioners of medicine and dentistry. Any other course of procedure is in direct violation of the letter and spirit of all *Medical Practice Acts.*

That a question of sex is not at the root of the antipathy toward the nurse-anesthetist is evidenced by the number of women physicians who are members of the various associations of anesthetists in this country and England. The nurse-anesthetist must go because she is unlicensed, and because her employment is as much an economic crime against the profession and public as *fee-splitting.*

It is up to the American College of Surgeons, during its forthcoming meeting in 'Frisco, to take action in this matter, or stand convicted of playing favorites, violating medical ethics and alienating a certain proportion of licensed practitioners from a legitimate source of financial support.—F. H. M.

NITROXID ANESTHESIA—A SUGGESTION.

In a personal communication to the EDITOR, Dr. W. P. Burdick, of Kane, Pa., suggests the use of the term *Nitroxid Anesthesia* to replace the rather cumbersome title of *Nitrous Oxid-Oxygen Anesthesia* for that important method of narcosis.

Some time ago, Dr. C. A. L. Reed suggested the term *Anocithesia* as a substitute for *Anoci-Association Anesthesia,* but the innovation was not accepted and we met with considerable criticism. Perhaps Dr. Rose could give us the correct terms for these procedures in irreproachable Greek derivatives, but even that would not insure their use.

For such hybrids to achieve popularity they must catch on, and in this hope the EDITOR presents these suggestions for popular approval and usage, knowing that this verdict alone will assure them a permanent position in medical nomenclature.—F. H. M.

Book Reviews

(*Continued*)

To the expert anesthetist the *kinetic theory of shock*, and its *histologic pathology*, will come as a logical sequence to the original researches of Ramon j Cajal on the cerebral changes under anesthesia, presented to the Eleventh International Congress of Medicine in Madrid. Cajal was inclined to attribute these cellular alterations entirely to the effects of anesthetic agents, but Crile's further researches have developed their relation to emotional, traumatic and sensory stimulation. The studies of Fischer, Hogan and Yandel Henderson on the causation of *acidosis* apparently promise to add additional importance to fear, hyperactivity and sensorial stimulation as factors in contributing to postoperative complications, not controlled by *anoci-association* methods. In this connection it is interesting to note that Crile concludes that nitrous oxid, of all anesthetic agents, especially in association with oxygen, induces fewer alterations in the central nervous system, and that consequently it is the safest anesthetic for hazardous risks, although one of the most difficult to administer properly.

In collaboration with Lower, Crile has adapted the methods of anoci-association to the operative technics now commonly in vogue, and this practical exposition of his theory, put to the test of clinical practice, is the more interesting part of the monograph to the surgeon and anesthetist.

Regarding preliminary alkaloidal medication, Crile's dictum that morphinization is always indicated unless acidosis already presents, should be remembered; as also the fact that opiates, in complicating acidosis, materially delay the postoperative alkalinization of the blood, this condition being diagnosed and controlled by the H-ion contents of the blood.

Valuable suggestions are made regarding the proper use of novocain and adrenalin and quinin and urea hydrochlorid, in proper solution strengths and for special tissues and sites of injection. Especial attention is drawn to the value of anoci-association in two stage operations, in abdominal and gynecological surgery, genito-urinary operations, and many other procedures, such as goitre and imperiling sepsis in which the hazard to the patient's life is extreme.

A contribution to the practical use of nitrous oxid-oxygen anesthesia, as a factor in *anoci-association*, is appended by Agatha Hodgins, as is also a description of the Lakeside Hospital plant for the manufacture of the anesthetic agent. The Anesthesia Department in this issue presents Dr. A. R. Warner's latest conclusions regarding this plant, with an illustration to depict some of its revolutionary devices for obtaining an absolutely pure product.

A thorough familiarity with the *kinetic theory of shock* and the methods of *anoci-association anesthesia and surgery* will breed a contempt for the crude manner in which the patient's safety and comfort were relegated to secondary consideration in the past.

Anemia and Resuscitation: An Experimental and Clinical Research. By George W. Crile, M.D., F.A.C.S., Professor of Surgery, Western Reserve University, Medical College; Surgeon to Lakeside Hospital, Cleveland, Ohio. *First Edition.* Octavo, leather binding, 305 pages, 16 illustrations. D. Appleton & Company, London and New York, 1914.

This monograph of Crile's is based on studies of anemia as it affects the body as a whole or its component parts, made in an endeavor to solve certain practical clinical problems confronting the surgeon, anesthetist and internist.

Crile early establishes the fact that in resuscitation of the body as a whole, the greatest and most essential difficulty to be overcome is the anemia of the brain. In apparent death from drowning, gas poisoning, electric shock, operative manipulation and hemorrhage, the organ which most quickly succumbs beyond the power of reanimation is the brain rather than the heart. The monograph is virtually a development of this thesis, supported by exhaustive laboratory experiments.

Since continued normal action of the heart and lungs is dependent on the activity of the brain, the presence or absence, as well as the degree and duration of anemia of the latter organ, decides the possibility of resuscitation, and is also the determining factor in the restoration of functional activity. Kuliabko's brilliant work in making the heart continue to beat after its removal from the body, supplemented by the work of Hill, Batelli, d'Halluin, and others abroad, and of Stewart and his associates in this country, paved the way to further study of the automaticity of action of that organ. Attempts to resuscitate the body as a whole by massage of the heart, artificial respiration, or by the injection of saline and other solutions into the circulation, were the natural sequence of their results. The experiments from the author's laboratory, presented in this monograph, are a continuation of those on surgical shock, in which it was shown for the first time that the blood-pressure of a decapitated dog could be maintained for hours by means of the slow, continuous infusion of normal saline solution and adrenalin. This again led naturally to the use of adrenalin-saline intravascular infusion combined with rhythmic pressure of the chest, as a means of resuscitation.

The studies of anemia of the central nervous system are of especial interest to the surgeon and anesthetist, as they offer a solution for hitherto unexplained catastrophes on the table and untoward sequelæ following apparently successful operations. The intimate relations existing between cerebral anemia, anesthetic fatalities, the difficulties of resuscitation and the incidence of the postoperative paralyses are explained in detail, and the author suggests many practical methods for combating these complications, notably, clamping of the larger arteries instead of ligation. These researches are a corollary to Wyeth's "Ligation of the Carotids," and are an invaluable contribution to *safety first* in extra hazardous surgical risks.

The field of local anemia, associated with embolism and thrombosis, too tight application of bandages and other apparatus, localized pressure from the weight of the body in unconscious patients, twisted pedicles of tumors and organs, too tight packing of wounds and incarceration and strangulation of the intestines, has been thoroughly canvassed, and from a wealth of experimental data and clinical results, proper prophylactic and restorative measures have been developed, and have stood the test of clinical practice and results. A mastery of these newer problems in local anemia is a prime requisite for the progressive surgeon who attempts the work of Carrel in transplanting organs, bones or tissues from one individual to another. Successful transplantation presupposes a thorough knowledge of the power of any given organ, bone, tissue or gland to resist anemia while the operation is being performed, and a definite technic for establishing a sufficient circulation to conserve the vitality of the transplant.

The author acknowledges his indebtedness to Drs. D. H. Dolley, Lawrence Pomeroy, A. M. Tweedie, H. G. Sloan and J. B. Austin, for their cooperation in the experimental phases of his work.

The monograph is so fascinatingly written that in the pleasure of reading it one is apt to overlook its fundamental scientific significance; but even a cursory perusal leaves the reader with the impression that he has acquired very vital information with no effort at all.

The Principles and Practice of Tooth Extractioe and Local Anesthesia of the Maxillae. By William J. Lederer, D.D.S., Dental Consultant to the German Hospital, New York City. *First Edition*, pp. 262, illustrated with 120 textual figures and 8 figures on 4 plates. The Rebman Company, New York, 1915. Price, $3.00.

In offering this little volume the author does not presume to have fully exhausted his subjects, but has presented them in compend form to aid both the dental student and practitioner and to recall to their minds that tooth extraction is a surgical procedure and must be carried out accordingly. Thanks to the pioneer work of Braun and Fischer, painless dentistry under local or conductive anesthesia has become a reality, and Lederer is

enthusiastic in endorsing the latter technic for all intraoral operations.

Appreciating the systemic complications arising from mouth infections, Lederer points out the true aspect of dental and oral operations, based on this conception of etiology and pathology. Regarding cleanliness and sterilization he advocates the same care and precautions as are exercised for an abdominal section. He believes in establishing cordial relations with patients, examining them thoroughly, particularly with the *x*-ray, and in properly preparing them for the operative ordeal, so that they will withstand it safely and with the least possible discomfort.

The indications for extraction are given in detail, and the minutiæ of instrumentarium, drugs and dressing are thoroughly covered. Following a painstaking exposition of the technic of normal extractions, Lederer devotes considerable attention to root extractions and the methods of dealing with impacted and unerupted teeth. In handling these subjects Lederer emphasizes the value of scientific surgery, coupled with individual skill and cleverness. His chapters on post-extractive care and the treatment of complications are replete with valuable suggestions.

Part II of the volume is devoted to a detailed description of general, local, conductive and regional anesthesia, of which methods Lederer prefers the conductive. He describes the preparation of solutions, his armamentarium, the anatomical topography and injection technics, and also considers indications and contraindications to the respective methods.

Lederer fully appreciates that shock may readily occur during intraoral operations, and he gives judicious advice regarding the treatment of this complication. He appends his own records regarding results under the use of conductive anesthesia, in proof that he is not overly enthusiastic. He also appends chapters on poisons and their antidotes, the treatment of emergencies, and formulæ and useful prescriptions.

While the binding, typography and printing of this volume are in the usual good style of the Rebman press, it is to be hoped that in succeeding editions larger and more illuminating illustrations will be secured.

Annals of Surgery—General Index. Volumes Fifty-one to Sixty, 1910-1914. Paper covers, pp. 88. ANNALS OF SURGERY, Philadelphia, 1915. Price, $1.00.

This General Index of the last ten volumes of the "Annals of Surgery" is a very handy reference guide to the many original communications on the advances in anesthesia and analgesia during the past decade, aside from its almost exhaustive references to the surgical progress of the same period. Cross-references make this index an easy one in which to locate either the authority or subject desired.

Visiting lady guests of the Interstate Association of Anesthetists, photographed in front of the New Hotel Gibson, just before their auto trip to the Art Museum during the Organization Meeting in Cincinnati, May 4-5.

Society Proceedings.

Membership in a society devoted to your specialty is an essential to success.

THE INTERSTATE ASSOCIATION OF ANESTHETISTS.

The Organization Meeting of the Interstate Association of Anesthetists, held in Cincinnati, May 4-5, 1915, was a decided success in every sense of the word. There was a large attendance of anesthetists, interested surgeons and research workers, and the association was launched with a charter membership of eighty-six, from points as distant as New York, Atlanta, San Francisco and Montreal. While the limitation of membership is unrestricted, the association decided to limit its place of meeting to the following states: West Virginia, Ohio, Kentucky, Tennessee, Indiana, Illinois and Michigan, in order not to conflict with the activities of other anesthetic organizations.

The Program of the Scientific Sessions, as printed in the April issue, was carried out with the absence of only one essayist. As the Transactions will be published in full in the Anesthesia Department there is no occasion to enter into a detailed account of them now.

One hundred members in attendance and their lady guests participated in the Organization Dinner. The menu was excellent and Victrola music and selections by the

Gibson Hotel Orchestra enlivened the intervals between courses. Dr. W. D. Haines proved himself, as usual, an altogether charming toastmaster, and after felicitating the association on its organization, introduced the various speakers of the evening. Dr. Louis Ransohoff travestried the "Anestheasiest Way" in a droll manner, and suggested many amusing possibilities for phonographic music as an accompaniment of operative procedures under local analgesia, among which not the least amusing was the contretemps of having the Victrola nurse, after a successful Cesarean section, grind out the popular hit: "Can't You Take It Back and Change It for a Boy?" Dr. Otto Juettner, the medical historian of the Ohio Valley, gave a new interpretation of the first operation under any anesthetic, and proved to his own satisfaction that it was not a *rib-resection,* but a *complete laminectomy,* as everyone was fully aware of the fact that since its occurrence in the Garden of Eden man has never had any backbone left. This was by way of paying his respects to the "Woman—the Eternal Narcotic." Dr. W. Hamilton Long's address on "Anesthesia—a Full-fledged Specialty," was enthusiastically received. It is printed in full in this issue.

Dr. E. S. McKee, raconteur and globe-trotter, related many "Anesthetic Anecdotes," of which an interesting one was the description of an operation for multiple fibroids, performed by that remarkable pioneer in gynecology, the late lamented Dr. Thad Reamy, assisted by the genial Dr. Bonefield. It was done on the wife of a colored parson in Covington, Ky., and was begun at three in the afternoon, but not completed until half after nine that night. The anesthetic was administered by Dr. Robert Carothers, who welcomed the association to Cincinnati, on behalf of the local profession, and as second assistant it was the duty of Dr. C. A. L. Reed, erstwhile President of the American Medical Association, to provide light for the operative procedure after dusk had fallen. This he did by standing on a rickety kitchen chair, holding an old oil lamp in one hand, and reflecting its rays into the abdominal cavity by means of a cracked hand-mirror held in the other. Truly a picture worthy of the brush of some renowned historical painter.

Dr. F. G. DuBose, although not on the banquet program, at the earnest solicitation of the toastmaster, told some of his dialect stories in his own inimitable way, notably the obstetrical incident of the old colored mammy, who, after trying all her African necromancy on a primipara without avail, attempted to *"smoke the derned thing out!"*

Mrs. W. A. Teveluwe's toast on "Man—the Counter Irritant," was a pleasant innovation and a compliment to the rampant feminism in the new association. Your correspondent cannot resist the temptation of quoting her concluding remarks by way of congratulation to the association, its purpose and achievement:

"An old man going a lone highway
Came at the evening, cold and gray,
To a chasm vast and deep and wide.
The old man crossed in the twilight dim,
The sullen stream had no fear for him.
But he turned, when safe on the other side,
And built a bridge to span the tide.

"Old man," said a fellow pilgrim near,
"You're wasting your strength in building here;
Your journey will end with the passing day;
You never again will pass this way;
You've crossed the chasm deep and wide,
Why build you this bridge at eventide?"

The builder lifted his old grey head—
"Good friend, in the path I've come," he said;
"There followeth after me today
A youth, whose feet must pass this way.
This chasm that has been but as naught to me,
To that fair-haired youth may a pitfall be;
And he must cross e'er the twilight dim;
Good friend, I am building this bridge for him."

"You, who are gathered here as Charter Members of the Interstate Association of Anesthetists, are, as it were, the Builders of Bridges, upon which the specialists in anesthesia of a younger generation will cross, confident of the victory of life and science that lies before them. But you will have the consolation of having made the way. Builders of Bridges, I envy and congratulate you."

The visiting lady guests of the association were royally entertained by Dr. Nora Crotty and the Local Committee of the Cincinnati Academy of Medicine. A tea and reception at the Woman's Club preceded the Organization Dinner, and after that they were taken to a theater party to witness the production of "Grumpy," which was thoroughly enjoyed. The next afternoon was devoted to an auto sight-seeing tour of Cincinnati, with a visit to the Art Museum and Rookwood Pottery. It is the intention of the Interstate Association of Anesthetists to so entertain all lady guests that it will be a temptation for every member to bring his wife, sister or sweetheart to all future meetings.

The following organization officers were re-elected: Chairman, Dr. W. Hamilton Long, Louisville, Ky.; Vice-Chairman, Dr. Isabella C. Herb, Chicago, Ill.; Secretary-Treasurer, Dr. F. H. McMechan, Cincinnati, O.; Executive Committee: Dr. A. E. Guedel, Indianapolis, Ind.; Dr. John Evans, Buffalo, N. Y.; Dr. W. P. Burdick, Kane, Pa.; Dr. W. I. Jones, Columbus, O.; Dr. Moses Salzer, Cincinnati, O.; Dr. W. N. Lynn, Knoxville, Tenn.

During the business session, after adopting the Constitution and By-Laws, the following resolutions, presented by Dr. Charles K. Teter, President of the American Association of Anesthetists, were unanimously endorsed:

"Whereas, The Industrial Commission of the State of Ohio, under the Workmen's Compensation Act, has established the anesthetist's fee at five dollars ($5.00), irrespective of the inherent hazard of the case, the duration of anesthesia and the method of administration involved; and

"Whereas, It is generally recognized that in 80 per cent. of operative procedures anesthesia presents a greater immediate risk of life than the surgical procedure itself; and

"Whereas, Under present fee conditions the surgeon must use the cheapest method of anesthesia as well as employ the least experienced administrator he can secure, regardless of safety; and

"Whereas, This state of affairs practically prohibits the employment of expert anesthetists and certain methods of anesthesia, notably nitrous oxid-oxygen; and

"Whereas, Such expert service and such advanced methods of anesthesia would reduce the liability of the loss of life under operations to a minimum, therefore

"Be it Resolved, That the Interstate Association of Anesthetists in convention assembled do hereby urge the Industrial Commission of the State of Ohio to amend its ruling regarding the anesthetist's fee, so that in all cases involving an inherent hazard of life from the anesthetic itself or its prolonged administration, a minimum fee of ten dollars ($10.00), and a maximum fee of twenty-five dollars ($25.00), be established for the administration of ether and chloroform, and that a rate of twenty-five dollars ($25.00) an hour or fraction thereof be established for the administration of nitrous oxid-oxygen anesthesia.

"Be it further Resolved, That fees covering services rendered by an assistant or anesthetist shall not be paid out of the Workmen's Compensation Fund, unless such services are rendered by a legally qualified medical or dental anesthetist, as determined by Section 1287 *of the Ohio State Code;* and

"Be it finally Resolved, That a copy of these Resolutions be submitted by the Secretary to the Ohio Industrial Commission for favorable action; and that they be published in the Official Organ of the Association and other journals of the medical and dental press."

On account of its activities in advancing the science and practice of anesthesia and analgesia and its efforts to improve the status of the anesthetist, the American Journal of Surgery was selected as the Official Organ of the Interstate Association of Anesthetists.

The decision regarding the time and place of the Second Annual Meeting was left to the discretion of the Executive Committee, with the understanding that the meeting would be held in conjunction with some other medical or dental association.

The Interstate Association of Anesthetists is deeply indebted to Dr. E. O. Smith, Chairman of the Local Committee on Arrangements for the Ohio State Medical Asso-

ciation Meeting, for his cooperation in promoting the joint session and for material assistance in defraying the organization expenses. Also the Hotel Gibson outdid itself in hospitality, and those present carried away very pleasant recollections of Mr. Hawk, who made the arrangements for the scientific sessions, and Mr. Oberley, who served the Organization Dinner. In this connection, it must not be overlooked that the Cincinnati Chamber of Commerce, through its Convention Manager, Mr. Dehoney, was conspicuous in its efforts to entertain the visiting ladies.

LOUISVILLE SOCIETY OF ANESTHETISTS.

For several years the desirability of establishing an organization in Louisville for the special discussion of anesthesia has been felt. Nothing definite was done until last winter, when the University of Louisville appointed a staff of nine specialists to supervise the administration of anesthesia at the new Municipal Hospital. Shortly after this, in March, Dr. W. H. Long invited these appointees to an informal meeting to discuss the possibility of organizing a local society of anesthetists. The following anesthetists met at the home of Dr. Long: Drs. H. S. Eggers, Jno. W. Heim, E. L. Henderson, D. Y. Keith, J. A. Kirk, E. O. Sage, T. K. Van Zandt and E. F. Horine. Plans were discussed and it was unanimously decided to permanently organize a local society.

A second meeting was held in April, with Dr. J. A. Kirk as the host. At this time a Constitution and By-Laws were adopted.

The first regular meeting was held on May 14, 1915, with Dr. E. L. Henderson as host. The following members were present: Drs. Eggers, Heim, Henderson, Keith, Kirk, Long, Van Zandt and Horine. The meeting was called to order by Dr. Jno. W. Heim, acting as chairman pro tempore. The following officers were then elected for the year 1915-16: President, Dr. W. H. Long; Vice-President, Dr. Jno. W. Heim; Secretary-Treasurer, Dr. E. F. Horine.

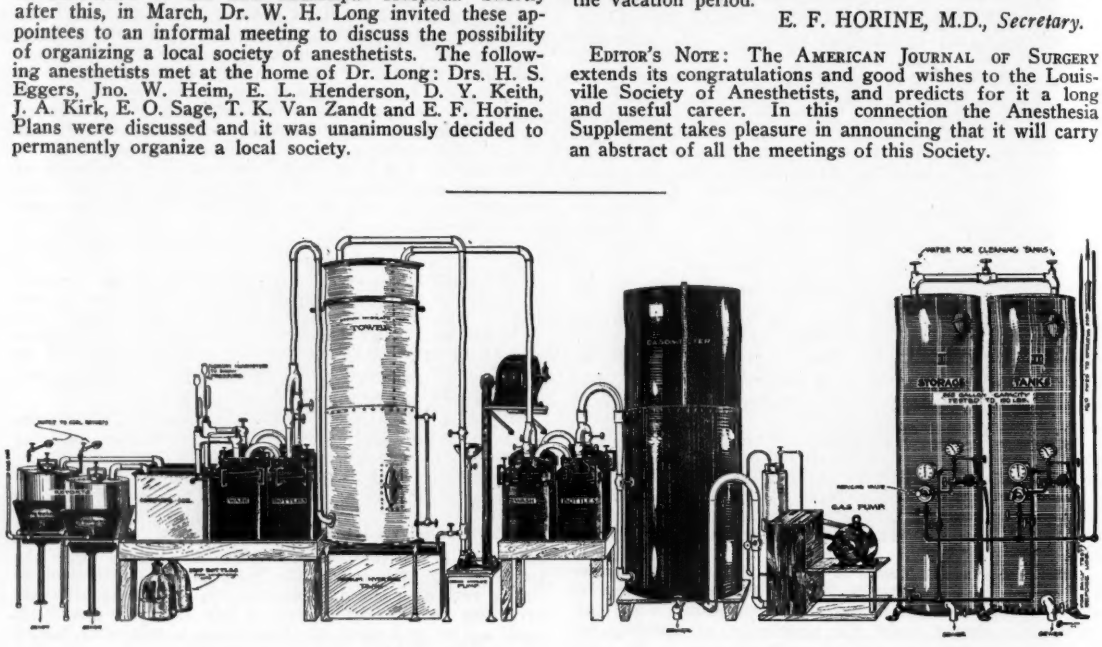
Interesting cases were reported by Drs. Kirk and Heim, and a general discussion followed.

The essay of the evening, "Anesthesia, Past and Present," was read by Dr. T. K. Van Zandt, and discussed by Drs. Long, Kirk and Heim.

The Society then adjourned to meet in September, after the vacation period.

E. F. HORINE, M.D., *Secretary.*

EDITOR'S NOTE: The AMERICAN JOURNAL OF SURGERY extends its congratulations and good wishes to the Louisville Society of Anesthetists, and predicts for it a long and useful career. In this connection the Anesthesia Supplement takes pleasure in announcing that it will carry an abstract of all the meetings of this Society.



Newer Apparatus

Editor's Note: From time to time this Department will publish Illustrations and Technical Details of the Newer Apparatus for Anesthesia and Analgesia.

THE MANUFACTURE OF NITROUS OXID FOR ANESTHESIA IN HOSPITALS.

A. R. WARNER, M.D.,
Superintendent of Lakeside Hospital, Cleveland, Ohio.

There are now evidences that the use of nitrous oxid-oxygen anesthesia will become more general than it has been, and we are hearing of other hospitals who are considering the installation of apparatus, as we have done at Lakeside, to manufacture the gas. It may therefore be timely and perhaps helpful to publish the story of its manufacture and use at Lakeside, in part as a warning against pitfalls and in part as evidence that success in manufacture can be attained.

At Lakeside Hospital nitrous oxid gas has been used for anesthesia extensively for about eight years and has been manufactured in the hospital as part of the routine for more than five years; and for this length of time nitrous oxid-oxygen has been the anesthetic of choice. Our experience, therefore, has amounted to the use of approximately 500,000 gallons in about 2,700 operations yearly.

For the first four years our gas was not entirely satisfactory, and at times not without harmful effects. This was overlooked at first, partly because on the whole we had as good results as others, and partly because it was still believed that cyanosis was necessarily present during nitrous oxid-oxygen anesthesia. As our pioneer anesthetist, Miss Hodgins, developed more skill with this anesthetic she was able to demonstrate to us that the cyanosis, and the irritation and the symptoms of toxemia following anesthesia, were present to a greater or less extent in all or several patients on the same day, and on other days were completely absent; and she convinced us that the gas contained a variable amount of some poison. Commercial gas, although not without these effects, seemed more uniform, and distinctly less irritating. This difference seemed fairly constant, although our plant and methods of manufacture were the same as the commercial plants known to us. On our worst day one patient of the gynecological service died, with all the symptoms of a severe toxemia, a few hours after a simple operation; one patient of the surgical service was severely poisoned, and three others suffered to a lesser extent. The predominating symptom was a cyanosis that no

amount of oxygen could dispel. It seemed certain that the hemoglobin had been damaged, and our surgeons learned that out-of-door fresh-air treatment was most effective. The condition, with the exception of the color, resembled carbon monoxid poisoning, but unfortunately no spectroscopic examinations of the blood of these patients were made.

At last, about two years ago, it became evident to all that nitrous oxid must be obtained in greater purity or its use in the hospital abandoned. On the good days this anesthesia was so satisfactory and so easy for the patient that it seemed best to make every effort to make it right. The best consulting chemists obtainable were called to examine the plant and methods. Each pointed out possible defects and all agreed that better apparatus and methods could probably be developed by experiment. Each called attention to the great number of possible impurities. One of our trustees, Mr. H. M. Hanna, then offered to provide the funds necessary to run an experimental plant at the hospital, and the writer undertook to solve in such a plant two problems:

First—To find a method for the manufacture of nitrous oxid of sufficient purity to be without poisonous effect.

Second—To devise apparatus by which this can be done in a routine way in hospitals under hospital conditions.

The details of the many experiments with chemical processes and types of apparatus need not be presented. The net result of the first six months' work was merely that we obtained more uniform gas, and we did not have the very bad days. About this time we found that nitric oxid, even when present in large amounts, was entirely removed from the nitrous oxid by confinement in iron tanks over night. This explained the lesser irritation from commercial gas, which is always shipped in iron cylinders. Commercial gas had always been free from nitric oxid, while our gas, which was sometimes used without standing long in the tanks, had not been free from it. In these experiments we became convinced that the poisonous effects were, at times at least, not from the nitric oxid, which has been the generally dreaded impurity.

The impurities theoretically possible to produce in the destructive distillation of even a pure ammonium nitrate in an iron or other reducing retort are many: among them are free ammonia and many of the more highly organized, well-known hemoglobin poisons, such as the hydrazines, hydroxylamines, and others. It seemed possible that these were causing the trouble. Our gas and the best samples of commercial gas obtainable were found slightly alkaline to phenolthalein. Published analysis of commercial nitrous oxid had reported the presence of ammonia and nitrogen. This certified to the presence of ammonia, or of substances breaking down to ammonia. A thorough washing with strong sulphuric acid was then added as another step in the process of purification. On this day—now over a year ago—our gas became absolutely neutral in reaction, and the peculiar cyanosis disappeared from our operating rooms, never again to appear when acid-washed gas was used. We have, however, seen it each time that the installation of new apparatus in the plant made it necessary for us to shut down and for a few days use commercial gas *not* scrubbed with acid.

As a further result of our experiments, it may be mentioned that our plant has been changed from the conventional commercial plant in the following essential particulars:

1. The use of a retort material less liable to attack by the vaporized ammonium nitrate. The iron retorts were corroded through in about six weeks. The best material yet found, having the required strength, is a 95 per cent. aluminum compound. (In this retort ammonium nitrate is heated, forming, theoretically, pure nitrous oxid and water, but, practically, a mixture of many nitrogenous compounds.)

2. The use of larger outlets for the retorts, fitted with packing joints connecting directly with larger caliber piping, thereby removing 60 per cent. of the back pressure and lowering the boiling temperature.

3. Discontinuation of the use of glass tubing entirely, because it was too easily broken.

4. The practice of cooling the gas immediately to about 10° C., to remove the water (45 per cent. by weight), and to catch and recombine the greater part of the dissociation products of the distillation.

5. Oxidation of nitric oxid to nitric acid, which is removed by the scrubbing with sodium hydrate (10 per cent. solution) which follows.

6. The scrubbing with sulphuric acid (20 per cent) mentioned above, which follows the scrubbing with sodium nitrate.

7. The insertion of mercury monometers after each process to act as a signal to indicate any obstruction, leak, or unusual condition, and to give (by comparison) enough evidence of rate of gas flow to be a satisfactory indicator for practical purposes.

8. We have also developed more satisfactory models for several parts of a plant of hospital size, some of which are along new lines.

Laboratory experiments by Dr. H. G. Haskins, Associate Professor of Organic Chemistry and Biochemistry in Western Reserve University Medical College, have confirmed the following points:

1. The advantage of non-corroding retorts, which reduce and disintegrate less of the ammonium nitrate.

2. The advantage of distillation under lower pressure and temperature, in that it causes less dissociation.

3. The effectiveness of the cooling of the gas to remove the water and to recombine promptly the dissociation products. This large bulk of water catches a large proportion of the impurities too much changed to recombine.

4. The importance of the scrubbing with sulphuric acid to remove the free ammonia and other alkaline substances (as hydrazines and hydroxylamines) possibly present. The only alkaline substance identified, however, was ammonium. Without the acid washing the gas would contain alkaline substances organic in nature.

The existence of the more highly organized and more poisonous alkaline impurities has not as yet been demonstrated in samples tested, and animal work to determine whether free ammonia itself when inhaled in anesthesia can produce the effects noted, has not been done. The use of gas from our plant for a year, absolutely without ill effects, has lessened local interest in troubles from impurities. It is in a way unfortunate that these troubles were ended so promptly by practical methods before they were scientifically investigated. We hope the practical result will some day be fully explained.

To our minds the first problem has been solved: nitrous oxid can be manufactured in sufficient purity to be absolutely safe for use in anesthesia. We are not quite sure about the second problem. Unstinted funds for experimenting with apparatus have enabled us to develop a plant by which Lakeside can manufacture such a gas in routine and safety, but the walls and ceilings of our room still bear marks made by the pieces of bursted retorts and our employees have not forgotten the fumes which repeatedly filled the entire hospital from the *gas plant*. It is never entirely safe to place a pot containing a nitrogenous and an oxidizing substance over a fire. Many defects in the models of apparatus and troubles in handling of the purification have been overcome and nonessentials have been eliminated, so that it would now seem to us reasonable to expect any good chief engineer to supervise the plant and train a helper to run it; yet that remains to be demonstrated.

ADVANTAGES FROM THE PLANT.

The advantages derived from owning and operating such a plant may be summed up as follows:

1. There are no tanks in the operating room to explode, get in the way, or freeze up in the middle of an administration of the anesthetic.

2. Gas manufactured each day is compressed to 100 to 150 pounds pressure in iron tanks of 350-gallon capacity, and allowed to stand over night before use. From these tanks pipes lead to the operating rooms and a reducing valve regulates the pressure in these pipes accurately. The anesthetist is therefore assured of any volume of gas at uniform pressure (three pounds is used at

Lakeside), and at room temperature, which obviates the annoyance from the freezing of gas from cylinders, and the irritation to the patient from the very cold gas inhaled, and insures an absolutely uniform rate of flow at any and all times from the same machine with the controlling valve set at a given point.

3. It is possible to use machines adapted to low pressure. The dropping of the pressure in our pipes from thirty to five pounds and adapting the machines to this pressure reduced the average consumption of nitrous oxid thirty per cent., made the breathing distinctly easier for the patient, and the anesthetic decidedly more satisfactory. We have since lowered the pressure to three pounds with still more improvement in the anesthesia and further saving of gas. For October, November and December, 1913, our average consumption of nitrous oxid per hour of anesthesia given was 444.3 gallons; for the same months of 1914 the figure was 151 gallons.

These same advantages can be secured without actually manufacturing the gas, by installing the same system of tanks, pipes and reducing valves and purchasing the gas in the largest cylinders available. The cylinders purchased are filled to high pressures (1,500 pounds, often liquefied) and will discharge 97 per cent. of their charge into tanks at 100 pounds pressure; therefore this arrangement is much more satisfactory and economical than attaching either small or large cylinders directly to the machines for administering the gas.

We do not manufacture oxygen gas; we purchase it in large cylinders at 2,000 pounds pressure and it is discharged into tanks through reducing valves at 100 to 200 pounds and sent to the operating room, in pipes parallel to the nitrous oxid pipes, at three pounds pressure, regulated by a second reducing valve. The third reducing valve on the machine for giving the gas reduces to practically atmospheric pressure. Several types of portable systems of decompressing tanks (automatic) or gasometers (hand-regulated) have been devised to secure the same results; but all such are necessarily large and cumbersome, have no advantages and take up valuable space in the operating room.

4. A large element in the cost of commercial gas is in the compression of it to high pressures for shipment. It can therefore be manufactured in small plants at about 60 per cent of the cost of purchase. We have decided that this is a more satisfactory way to report cost than by our actual figures. The variation in the cost of a sufficiently pure ammonium nitrate will run in different localities nearly parallel to the variation in the cost of the gas, for it must be absolutely halogen-free and therefore, to be secured in the necessary quantities, must be especially made. This calculation is based on the use of 500,000 gallons per year and the employment of one man at $70.00 per month to run the plant under the supervision of the chief engineer. This percentage, therefore, will increase if less, and decrease if more, than this amount be manufactured yearly. It covers the upkeep of the plant, but does not allow for interest or general depreciation.

5. It is an advantage to have gas of known purity, and of sufficient purity to be absolutely safe. The tanks are fitted with a small outlet for testing. We test every lot of gas made, after it is in the tank and before it is sent to the operating room.

The result upon the quality of the product of scrubbing the gas with acid, as demonstrated at Lakeside, has convinced commercial dealers. Several companies have recently installed this process in their plants, so that it is now possible to purchase a safer commercial gas than heretofore.

THE COST OF INSTALLING A PLANT.

The cost of running pipes from the plant to the operating room depends entirely upon the distance and the difficulties. It is exactly the same as for running ¾-inch water pipe; and this figure can be determined and the work done by any plumber.

The cost of installing two storage tanks for nitrous oxid and one for oxygen, with all fittings, gate valves, pressure-reducing valves, and all accessories and labor, is about $600.00, varying a little with the nearness to boiler works and the local price of labor. This outfit and the piping to the operating rooms gives the hospital the first three advantages from the plant listed above, and will save one-quarter of the cost of the gases over any method of connecting commercial cylinders of any size directly to the machines for giving the gas; and it will also make possible distinctly better anesthesia. The outfit requires one hundred square feet of floor space in the basement, or wherever it is located, for the nitrous oxid tanks, and fifty square feet for the oxygen tank.

The cost of installing a manufacturing plant modeled after the plant at Lakeside, of a size having two retorts, is $1,500.00 to $1,800.00 in addition to the $600.00 for storage tanks and the cost of piping to the operating room. The exact figure varies on account of several factors, the most important of which are the facilities for connecting with water and sewer, and the method of securing the heat selected, i. e., gas, coke, oil or coal. The two-retort size is recommended for hospitals using anywhere between 100,000 and 1,000,000 gallons a year, because a mishap rarely affects both retorts. The plant to manufacture nitrous oxid will require three hundred square feet of floor space, and a small room (one hundred square feet) will also be needed for the storage of chemicals and supplies.

The additional cost of equipment to compress to liquefaction (1,500 pounds pressure) in order to fill small cylinders for use outside of the operating rooms, is $300.00. This would be advisable in some institutions, but in others unwise, the deciding factors being the amount of compressed gas used and the local price charged for it; also the qualifications of the chief engineer, as this pressure is too high to be handled easily. This equipment will occupy fifty square feet additional. The total floor space required amounts therefore to 600 square feet.

To give the reader some idea of the amount of machinery and apparatus of which such a plant as described above consists, the accompanying sketch is printed.

In order to insure to hospitals and the profession any and all advantages or benefits from methods in use or apparatus devised, applications for patents on all new processes and special designs have been filed in Washington, and all patents granted will be held by Lakeside Hospital to guarantee the free and unrestricted use of such advantages or benefits.—(*Modern Hospital.*)

Index and Abstracts

A Résumé of the International Current Literature of Anesthesia and Analgesia.

EDITOR'S NOTE: Authors of pertinent articles, who desire to have them indexed and abstracted, are cordially invited to send copies of the journals containing their contributions, direct to the editor, immediately on publication. Also the receipt of reprints for filing and reference will be duly appreciated.

ANESTHESIA, WHAT ADVANCES IN? Editorial, American Journal of Clinical Medicine, May, 1915.

ANESTHESIA FROM THE VIEWPOINT OF THE OCCASIONAL ANESTHETIST. S. E. Egart, Indianapolis Medical Journal, December, 1914.

ANESTHESIA, GENERAL, FOR EYE OPERATIONS. T. H. Butler, British Medical Journal, April 3, 1915.

ANESTHESIA, NEW INVESTIGATIONS REGARDING THE THEORY OF. R. Hober, Deutsche Medicinische Wochenschrift, March 4, 1915.

ANESTHESIA AND OPERATION, EFFECTS OF ON KIDNEY FUNCTION AS SHOWN BY THE PNENOLSULPHONEPTHALEIN TEST. R. H. Miller and H. Cabot, Boston. Archives for Internal Medicine, March, 1915.

ANESTHETICS. F. C. Vandervort, Bloomington, Ill. Illinois Medical Journal, May, 1915.

ANESTHETIST, IS HE SUFFICIENTLY TRAINED AS A SURGICAL ASSISTANT? S. F. Wiltsie, Seattle. Northwestern Medicine, May, 1915.

Anoci-Association, Nitrous Oxid-Oxygen in the Practice of. D. W. Deal, Springfield, Ill. Illinois Medical Journal, May, 1915.

Anoci-Association in Theory and Practice. A. B. Cooke, Los Angeles. Tennessee State Medical Association Journal, April, 1915.

Anoci-Association, Experiences with. C. G. Crisler, Cincinnati, O. Lancet-Clinic, April 10, 1915.

Anoci-Association: Shockless Operations. W. F. Campbell, Brooklyn. New York Medical Journal, February 13, 1915.

Anoci-Association: Combined Local and General Anesthesia in Major Surgery. L. Frank, Louisville, Ky. American Journal of Obstetrics, April, 1915.

Apparatus—An Improved Ether Mask. Wm. L. Wolfson, Brooklyn. Journal American Medical Association, March 6, 1915.

Apparatus—A Simple Apparatus for the Administration of Chloroform and Ether by the Vapor Method. O. M. Layton, Fond du Lac, Wis. Journal American Medical Association, March 6, 1915.

Apparatus—A New Method of Ether Administration. J. W. Snyder, Michigan City, Ind. Journal American Medical Association, May 22, 1915.

Apparatus—A Controller of Tongue and Palate During General Anesthesia. Jos. E. Lumbard, New York. Journal American Medical Association, May 22, 1915.

Chloroform and Ether Anesthesia. C. E. Vidt, Russell. Kentucky Medical Journal, April, 1915.

Deaths—Analysis and Mortality of Abdominal Surgery. R. E. Skeel, Cleveland. Michigan State Medical Association Journal, February, 1915.

Deaths from Intraspinal Injections of Novocain. C. Scandola, Gazetta degli Ospedalie delli Cliniche, Milan, January 14, 1915.

Ether, Employment of in Surgical Therapeusis. H. F. Waterhouse, British Medical Journal, February 6, 1915.

Ether, Action of on Certain Microorganisms. W. C. Topley, British Medical Journal, February 6, 1915.

Ether, Intramuscular Injection, General Anesthesia from. B. Formiggini, Policlinico, March 27, Nos. 11-13, 1915.

Intestinal Resection without Anesthesia. R. C. Turck, Jacksonville, Fla. Florida Medical Association Journal, February, 1915.

Local Anesthesia, Hyoscin and Morphin as a Preliminary to. L. M. Hurd, New York. Ophthalmology, April, 1915.

Local Anesthesia in Pathology and Treatment of Goitre. Benj. H. Breakstone, Chicago. American Journal of Clinical Medicine, April, 1915.

Local Anesthesia, Thyroidectomy under. A. E. Hertzler, Kansas City. Missouri State Medical Association Journal, February, 1915.

Local Anesthesia, Prostatectomy under. C. W. Allen, New Orleans. Surgery, Gynecology and Obstetrics, April, 1915.

Local Anesthesia in Skin Grafting by the Thiersch Method. E. P. Gould and C. W. Archer, British Medical Journal, March 27, 1915.

Local versus General Anesthesia in Surgery. E. Holzwarth, Deutsche Zeitschrift für Chirurgie, January, 1915.

Local and Spinal Anesthesia, Field for in Genito-Urinary Surgery. A. H. Crosbie, Boston Medical and Surgical Journal, February 18, 1915.

Local Anesthesia, Series of Cesarean Sections Performed under. J. C. Webster, Chicago. Surgery, Gynecology and Obstetrics, February, 1915.

Magnesium Sulphate Anesthesia, Nature of. M. Cloetta, Correspondenz-Blatt für Schweizer Aertzte, January 16, 1915.

Narcosis, Nature of. J. Traube, Berliner klinische Wochenschrift, March 29, 1915.

Narcotic Anesthesia. G. M. Ashtley, Philadelphia. Pennsylvania Medical Journal, March, 1915.

Nerve Blocking. M. L. Harris, Chicago. Surgery, Gynecology and Obstetrics, February, 1915.

Nerve Blocking, Local Anesthetics with Special Reference to. P. G. Skillern, Jr., Philadelphia. Pennsylvania Medical Journal, March, 1915.

Nerve Blocking with Novocain, 225 Cases of for Normal Labor. K. Bollag, Muenchener Medizinische Wochenschrift, February 23, 1915.

Nerve Blocking—Trigeminal—Brain. Abscess after Tooth Extraction, a Complication of. F. Bannes, Medizinische Klinik, April 4, 1915.

Nerve Blocking—Spinal Ganglia, Injection of with Alcohol. A. Chiasserini, Policlinico, April, Nos. 1-4, 1915.

Nerve Blocking—Injection of Alcoholic Solutions of Different Strengths into Peripheral Nerves. A Comparison of the Results Obtained. William B. Cadwallader, Philadelphia. Journal American Medical Association, June 5, 1915.

Nerve Blocking—Injection of the Spheno-Palatine Ganglion in some of the Commoner Diseases of the Nose. Harry L. Pollock, Chicago. *Illinois Medical Journal,* May, 1915.

Pollock, after reviewing the anatomic topography of the subject, suggests the use of spheno-palatine injections in hay fever, spheno-palatine neuralgia, hyperesthetic rhinitis and postoperative neuralgia.

The technic of the injection is as follows: The posterior end of the middle turbinate and nasal wall just posterior to it is obtunded with a 20 per cent. solution of cocaine. Neuralgic cases usually show immediate relief after this procedure, and this incident predicates a favorable result for the injection. Then a sword needle (Sluder) 5¼ inches long is employed. The needle is introduced from the septal side of the nose, transfixing the posterior end of the middle turbinate, after which it is pressed gently through the turbinate until the posterior wall is felt. The needle is then pushed upwards, outwards and backwards, through the bony wall, which is the anterior boundary of the spheno-maxillary fossa, in which the ganglion lies surrounded by connective tissue. Usually, by tactile sense, the operator feels the needle slip into the cavity. The ganglion is about 0.66 c.m. back of the wall. A 5 c.c. Luer syringe, filled with a 2 per cent. solution of carbolic acid in alcohol, is then attached to the needle, and 5 to 15 minims of the solution injected. If the needle succeeds in penetrating the ganglion, the patient complains of excruciating pain in the eye, ear, top and back of head and into the shoulder; but should the carbolic alcohol solution merely surround the ganglion, the pain is less severe.

The pain usually lasts anywhere from a few minutes to 24 or 48 hours, and it is in cases in which the pain is most prolonged that the end results are most gratifying. If the ganglion is injected the first time this usually suffices for a cure. Frequently further injections at short intervals are required; never more than four. In cases of neuralgia only the spheno-palatine ganglion is injected. In hyperesthetic rhinitis and hay fever it is advisable to inject the nasal branch of the ophthalmic as well. This can be successfully done by first obtunding the extreme superior anterior angle of the nose where this nerve first enters the nasal cavity, and then injecting a few drops of the solution at this point. There is comparatively no danger associated with these procedures if done under strictly aseptic precautions.

Nitrous Oxid Anesthesia. T. C. Burns, Oklahoma City. Oklahoma State Medical Association Journal, February, 1915.

Nitrous Oxid-Oxygen Anesthesia for Painless Dentistry. J. G. Hess, Lancaster, Pa. Dental Cosmos, May, 1915.

Nitrous Oxid-Oxygen Anesthesia. E. R. Zemp, Knoxville. Tennessee State Medical Association Journal, April, 1915.

NITROUS OXID, MANUFACTURE OF FOR HOSPITAL USE. A. R. Warner, Cleveland, O. Modern Hospital, March, 1915.

NITROUS OXID FOR PHYSIOLOGIC WORK, ANALYSIS OF. W. M. Boothby and I. Sandiford, Boston. American Journal of Physiology, May, 1915.

NITROUS OXID ANESTHESIA IN OBSTETRICS. J. C. Webster, Chicago. Journal American Medical Association, March 6, 1915.

NITROUS OXID ANESTHESIA IN OBSTETRICS. Frank W. Lynch, Chicago. Journal American Medical Association, March 6, 1915.

NITROUS OXID ANESTHESIA IN OBSTETRICS. A. E. Guedel, Indianapolis. Indiana State Medical Journal, March, 1915.

Nitrous Oxid and Oxygen Analgesia, Eutocia by Means of. FRANK W. LYNCH, Chicago. *Illinois Medical Journal,* April, 1915.

Lynch, in presenting this subject to the Chicago Medical Society, after recounting the historical aspects of the evolution of obstetrical analgesia, referred to the work of Klikowitch, which has to all intents and purposes been forgotten. Klikowitch started to work on the problems of obstetrical analgesia in Petrograd in 1879, shortly after Paul Bert's announcement that nitrous oxid and oxygen was a safe anesthetic for operations requiring a long period of time for their completion. In the *Archives für Gynecologie,* No. 20, 1880, he reported twenty-five cases, one of which was treated at home. He found that nitrous oxid given for three or four full respirations did not abolish consciousness, but did abolish pain, without altering the effectiveness of the uterine contractions. He proved this, to his own satisfaction, by timing the pains and their intervals both with and without gas, and by inserting a rubber balloon attached to a manometer and tambour, in three cases, to estimate the power of the expulsive force. It is astonishing that the completeness of this investigation and the satisfactory results obtained over thirty-five years ago left no influence in obstetrical literature. Perhaps the technic fell flat because Klikowitch was from Russia and because the profession was then looking for a *new* anesthetic rather than for a means of relieving the pain of the despised peasants in labor. Klikowitch does not mention the length of time during which the administration of the gas extended. Its administration was begun when the cervix was one and one-half finger breadths and was conducted intermittently, much as we are using it today.

Lynch's first experience with nitrous oxid-oxygen analgesia in obstetrics was in consultation with Dr. Hoag, in July, 1913. The patient was the daughter of Mr. Clark, a manufacturer of anesthetic apparatus, who was anxious to employ, at his own risk in his family, the method of preventing pain which had been so successful in dentistry.

The gas is best given through a nasal inhaler, since the proper level of analgesia is thus more easily maintained. It is started whenever the pains are troublesome or severe. Pure nitrous oxid is given at the beginning of the contraction, as determined by the hand. The patient must be cautioned not to lose consciousness, and to breathe deeply through the nose a certain number of times before bearing down. Five deep inhalations usually suffice to carry the patient *painlessly* through the most forceful contraction. At this time the inhaler should be removed or oxygen given to prevent the patient from lapsing too deeply under the anesthetic.

The key to success is the preservation of consciousness while the pain is controlled; and ultimate success depends on the co-operation of the patient. A light placed in view is a good guide to help in regulating the dose. When the light appears to waver the analgesia is too deep. The anesthetist or obstetrician must tell the patient when to begin to inhale. Left to their own devices, patients do not start to inhale until the contractions become painful, and under these circumstances the tendency is to breathe too deeply and frequently and go too deeply under. When the analgesia is carried past the proper stage a painful zone is encountered, in which cyanosis presents, associated with jactitory spasms and restlessness, and occasionally even nausea.

Gas in light dosage acts as a uterine stimulant, and the distention of the perineum is so thoroughly obtunded that frequently it is advisable to resort to complete anesthesia, at the moment of birth or to deliver between pains, to prevent too unexpected a delivery. It is often a matter of remark that infants delivered by Cesarean section under gas are not nearly so deeply anesthetized as when ether or chloroform has been used. No case I have as yet observed with this new method of obstetrical analgesia has presented a definite oligopnea. Respiration has been immediately established.

PAIN AND OTHER ORAL SENSATIONS, PROBLEMS OF. A. Hopewell Smith. Dental Cosmos, May, 1915.

SHOCK, POSTOPERATIVE, CAUSES AND TREATMENT OF. P. P. Nesbitt, Muskogee. Oklahoma State Medical Journal, February, 1915.

SHOCK. C. B. Taylor. What Cheer, Iowa State Medical Journal, April, 1915.

SHOCK, THE VASOMOTOR CENTER IN. Editorial Comment, Journal American Medical Association, May 8, 1915.

SHOCK, VASCULAR TONE AND DISTRIBUTION OF BLOOD IN. R. A. Morrison and D. R. Hooker, Baltimore. American Journal of Physiology, April, 1915.

SPINAL ANESTHESIA. W. A. Steel, Philadelphia. Pennsylvania Medical Journal, March, 1915.

SPINAL ANESTHESIA. L. L. Stanley, St. Quentin, California State Medical Journal, March, 1915.

SPINAL ANESTHESIA, VAGINAL HYSTEROTOMY UNDER. R. R. Cramer, Journal-Lancet, March, 1915.

SPINAL ANESTHESIA IN NATIVE PRACTICE. A. Y. Massey, Journal Tropical Medicine and Hygiene, April, 1915.

TONSILLECTOMY, FORWARD INCLINED SITTING POSTURE UNDER NITROUS OXID-OXYGEN ANESTHESIA, AND OTHER NEW FEATURES. Ira O. Denman and E. I. McKesson, Toledo, O. American Journal of Surgery, May, 1915.

TWILIGHT SLEEP—A BLESSING OR A CURSE. A. L. Mann, Elgin. Illinois Medical Journal, April, 1915.

TWILIGHT SLEEP IN LABOR, MORE ABOUT. Frederick Leavitt, St. Paul, Minn. American Journal of Clinical Medicine, April, 1915.

TWILIGHT SLEEP—SOME OBSERVATIONS ON THE USE OF SCOPOLAMINE-MORPHINE ANESTHESIA IN OBSTETRICS, BASED ON A REPORT OF 300 CASES. A. J. Rongy, New York. Medical Review of Reviews, April, 1915.

TWILIGHT SLEEP. J. O. Polak, Brooklyn. New York Medical Journal, February 13, 1915.

TWILIGHT SLEEP IN A SERIES OF 20 PRIVATE CASES. John Gardiner, Toledo. Ohio State Medical Journal, April, 1915.

TWILIGHT SLEEP—ANESTHESIA AND AMNESIA IN CHILDBIRTH. C. J. Andrews, Norfolk, Va. Virginia Medical Semi-Monthly, April 23, 1915.

TWILIGHT SLEEP—SCOPOLAMINE SEMINARCOSIS. G. C. Mosher, Kansas City. Surgery, Gynecology and Obstetrics, March, 1915.

TWILIGHT SLEEP. C. E. Dakin, Mason City. Iowa State Journal of Medicine, March, 1915.

TWILIGHT SLEEP—SCOPOLAMINE AMNESIA IN LABOR. W. F. B. Wakerfield, San Francisco. American Journal of Obstetrics, March, 1915.

TWILIGHT SLEEP—SCOPOLAMINE AMNESIA IN LABOR. J. T. Smith, Cleveland Medical Journal, January, 1915.

TWILIGHT SLEEP—SCOPOLAMINE NARCOPHIN ANESTHESIA IN LABOR. K. E. Schloessing, Freiburg, Germany. Medical Record, April 10, 1915.

TWILIGHT SLEEP—SCOPOLAMIN MORPHIN TREATMENT IN LABOR. A Critical Analysis of 60 Cases. J. L. Baer, Chicago. Journal American Medical Association, May 22, 1915.

TWILIGHT SLEEP—SCOPOLAMIN NARCOPHIN SEMINARCOSIS DURING LABOR. Walter E. Libby, San Francisco. Journal American Medical Association, May 22, 1915.

TWILIGHT SLEEP. J. W. Brannan, New York. Medical Record, May 1, 1915.